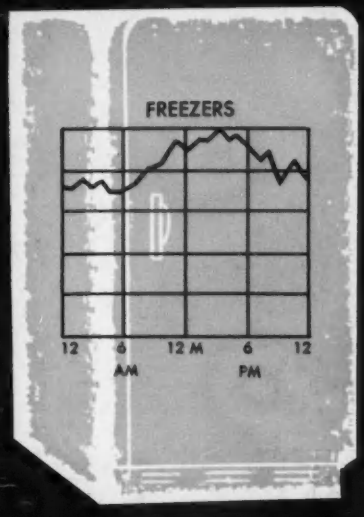
The Electrical Industry's Weekly Magazine

August 11, 1958

Electrical World

Price 50 Cents

A McGraw-Hill Publication



Texas Utilities Study 5 Appliance Loads

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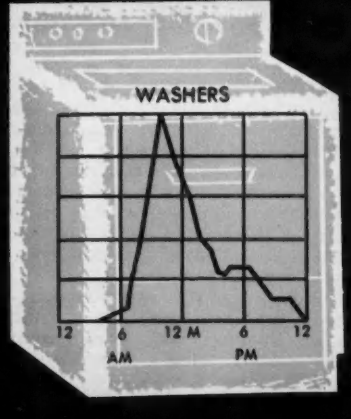

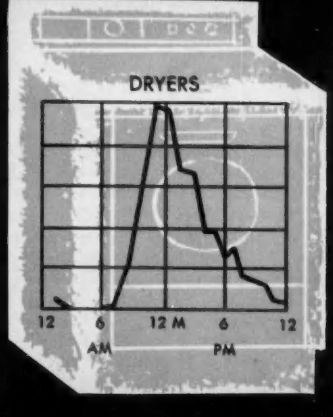

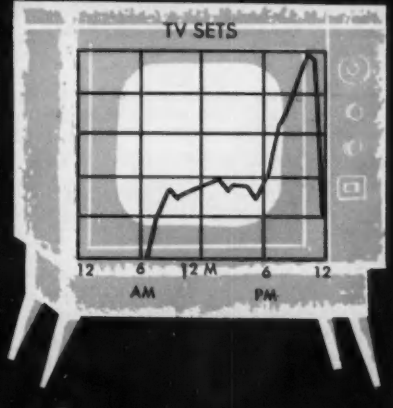

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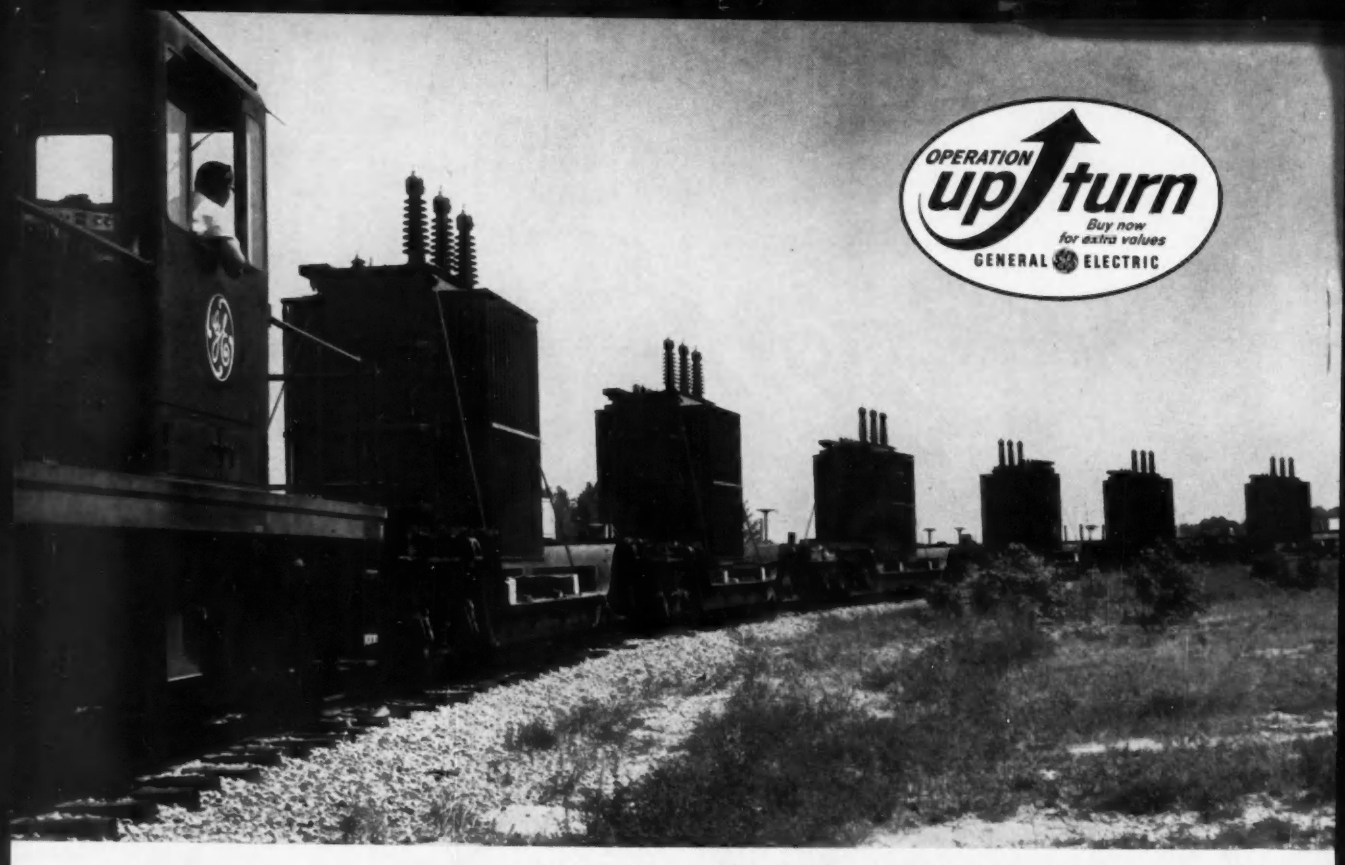

Repetitive manufacture of G-E standard-design medium transformers shortens delivery time, effects dollar savings for utilities. Also, simpler ordering procedures relieve electric utilities' engineers of time-consuming design and specification work.

OPERATION UPTURN spurs new interest in advantages of standardization

"extra values" inherent in standardized products take on new importance in present economic situation

Distribution transformer "changeouts" are simplified by standardizing on unit sizes and ratings.

Preferred Design transformers with uniform mechanical features and accessories expedite substation planning and construction.

General Electric's OPERATION UPTURN Program is designed to help accelerate the upturn in the nation's business by stressing "extra value" features of today's products. Electric utilities, for example, can obtain these extra values now, especially on standardized equipment. Major reason: the current economic situation re-emphasizes the importance of shorter shipments and savings to the user—traditional trademarks of standardized apparatus. Here are three examples:

MEDIUM TRANSFORMERS repetitive manufacture (RM) has brought 8% saving in price of these units—a saving to the industry of more than $20 million since 1943. In the next ten years, an additional $40 million can be saved if utilities step up the purchase rate of RM vs. "special" transformers.

POWER TRANSFORMERS incorporate "Preferred Design" components—features which utilities specified in a preference survey—so that improved transformers can be shipped 6 to 12 weeks faster, and also provide added economies through simplified substation and system planning. The PD Evaluation Form (GED-3400) outlines these benefits.

DISTRIBUTION TRANSFORMERS, standardized according to ratings and tank size, are stocked by more than 100 General Electric warehouses for extra-fast ordering and delivery. These allow electric utilities to safely slash their transformer inventories, reduce handling costs. "Changeouts" are also simplified since higher-rated units fit same mounting hardware and poles, in most cases, as lower-rated transformers being replaced. Result: important installation and maintenance savings for utilities.

To find out how the benefits of standardization are heightened by the current economic situation, contact your local G-E Apparatus Sales Office. General Electric Company, Section 301-389, Schenectady 5, New York.

MORE POWER TO AMERICA

GENERAL ELECTRIC

Electrical World

Vol. 150, No. 6 AUGUST 11, 1958

Published for 84 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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TVA Bond Financing: The Last Lap

Philip Sporn and others in the industry are bearish on effects of Kerr bill on which the House prepares to act.....p 34

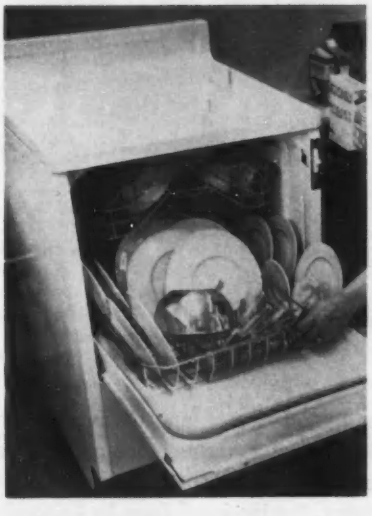
Detroit Edison Mounts Water Heater Drive

Goal is 100,000 units by 1962. Aims: boost saturation by 5%, and lay groundwork for all-electric promotion.....p 36

GENERATION

Dams Affect Water Properties

Reduced oxygen concentration in turbine discharge brings stream pollution charges against reservoir operators.....p 49



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DISTRIBUTION

Texas Utilities Study Appliance Loads

Here are the first published results of one of the most comprehensive and extensive surveys yet made of appliance load characteristics. Three subsidiaries of Texas Utilitities ran the study to determine saturation, load diversity, possible effects of sales promotions, and how to improve service on their systems.....p 40

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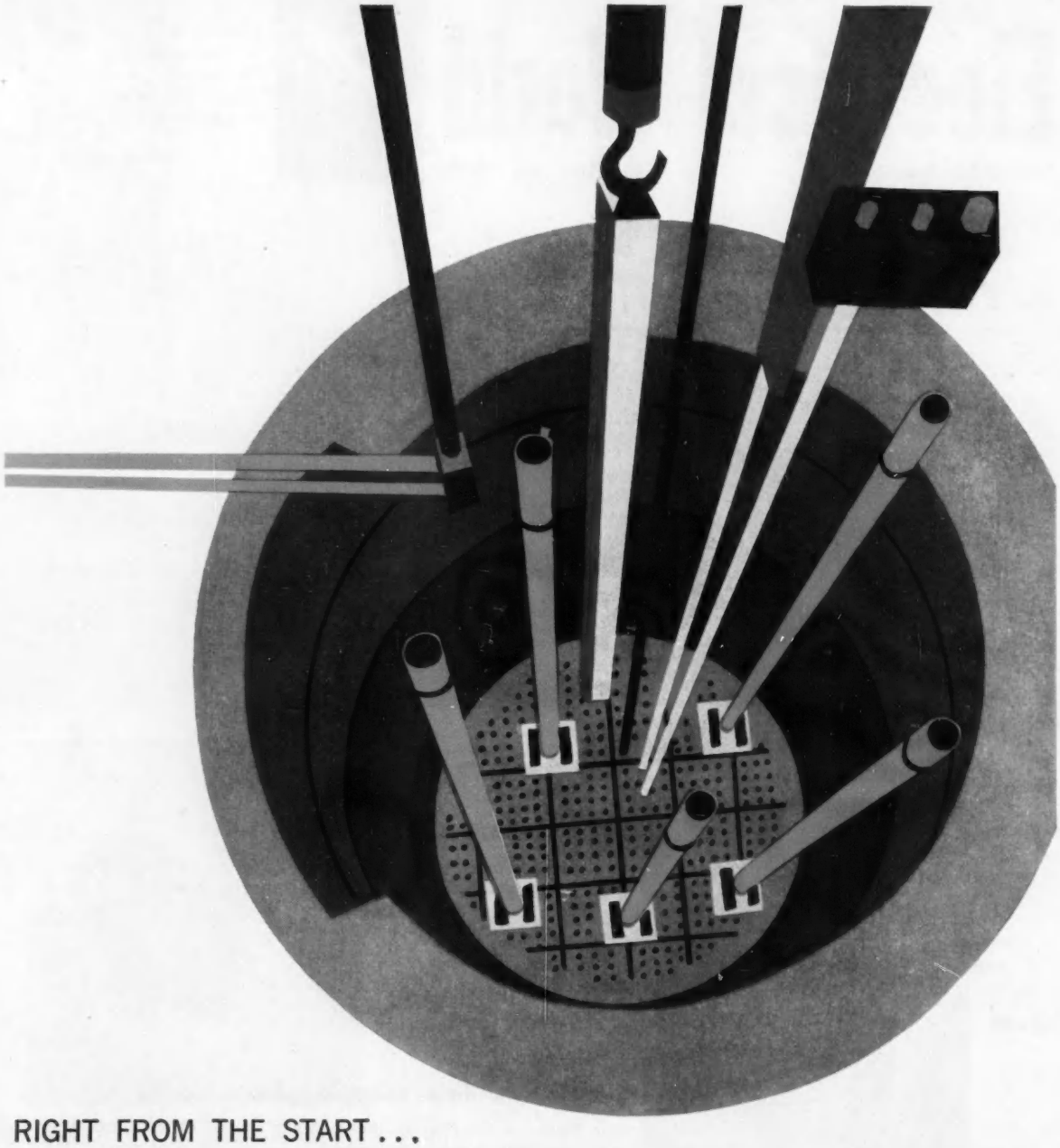

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When piping costs come close to the million mark — when the installation is vast, and the leeway for error is small — a piping job must be right from the start to finish. Grinnell assures this through complete one-company control and responsibility. From interpretive engineering — through exclusive methods of prefabrication and testing of pipe and hanger units — to precision assembly and delivery, the job is all done by Grinnell, as only Grinnell can do it. The result: installations of any size, at costs known before you start, with assured performance. Grinnell Company, Inc., Providence, R.I.

Current Grinnell piping responsibilities: Enrico Fermi Atomic Power Plant, Michigan; Ohio Power Company, West Virginia; National Aniline Division of Allied Chemical & Dye Corporation, Virginia; Memphis Light, Gas and Water Division, Tennessee; Aluminum Company of America, Indiana; South Carolina Electric & Gas Company, South Carolina; Duke Power Company, North Carolina; Union Bag-Camp Paper Corp., Virginia; Pennsylvania Power & Light Company, Pennsylvania; Holyoke Water Power Company, Massachusetts

GRINNELL

More News in Less Time

Nothing is more in the forefront of the collective mind of the people who write and produce Electrical World each week than the premium placed on reading time by you, our readers.

Therefore, we have instituted another in a continuing series of changes, all aimed at saving you time when reading EW. You'll find this change in the format of our news pages (pages 36 and 37 in this issue). They have been revamped to give you the news the way we think you want it—succintly, but with none of the important elements of the story omitted.

In addition to the time-saving features of this new format, we at Electrical World feel it offers another equally important advantage: It permits us to be more comprehensive. We can get more news into the same amount of space, and—we trust—you can be better informed on a wider variety of industry subjects.

This is, after all, the reason for our existence.

Fischer Black

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ELECTRICAL WORLD

Vol. 150, No. 6, Aug. 11, 1958

Published weekly by McGraw-Hill Publishing Co., Inc., James H. McGraw (1860-1948), Founder. Executive, Editorial, Circulation and Advertising Offices: McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Printed at 99-129 North Broadway, Albany 1, N. Y. See panel at right for information regarding subscriptions or change of address.

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United States and Canada subscription rate for individuals in the field of the publication $6.00 per year; single copies 50 cents. Other Western Hemisphere and the Philippines $20.00 payable in advance and other countries $30.00 payable in advance.

Second-class mail privileges authorized at Albany, N. Y. Title registered in U. S. Patent Office.

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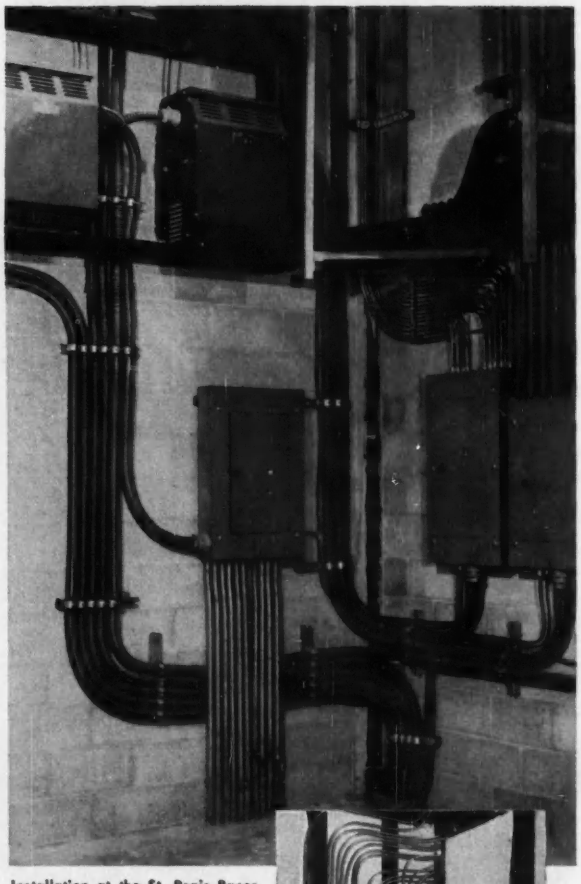
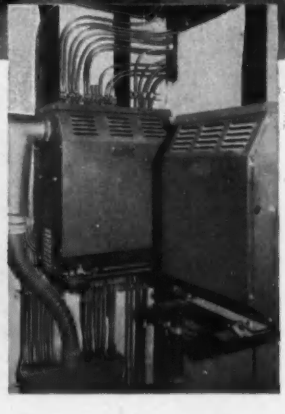
Only General Cable manufactures both...



Installation at the St. Regis Paper Company, Jacksonville, Fla. plant.

TYPE M.I. CABLE

for distribution, control and lighting circuits



INTERLOCKING ARMORED CABLE

for primary power feeder circuits

Easy to install in all locations, both Safety M I Cable and Interlocking Armored Cable require no mechanical protection, thus lowering costs of installation and minimizing space requirements. These constructions are easy to train around equipment or structural members, assuring the absolute minimum of interference, and present a neat, functional appearance. In addition, Safety M I Cable has unequalled physical and electrical properties: it is completely resistant to moisture, aging, nearly all chemicals, and operates at continuous high temperatures. For truly modern wiring in your plant, specify Safety M I Cable and Interlocking Armored Cable. And remember; only General Cable makes them both.

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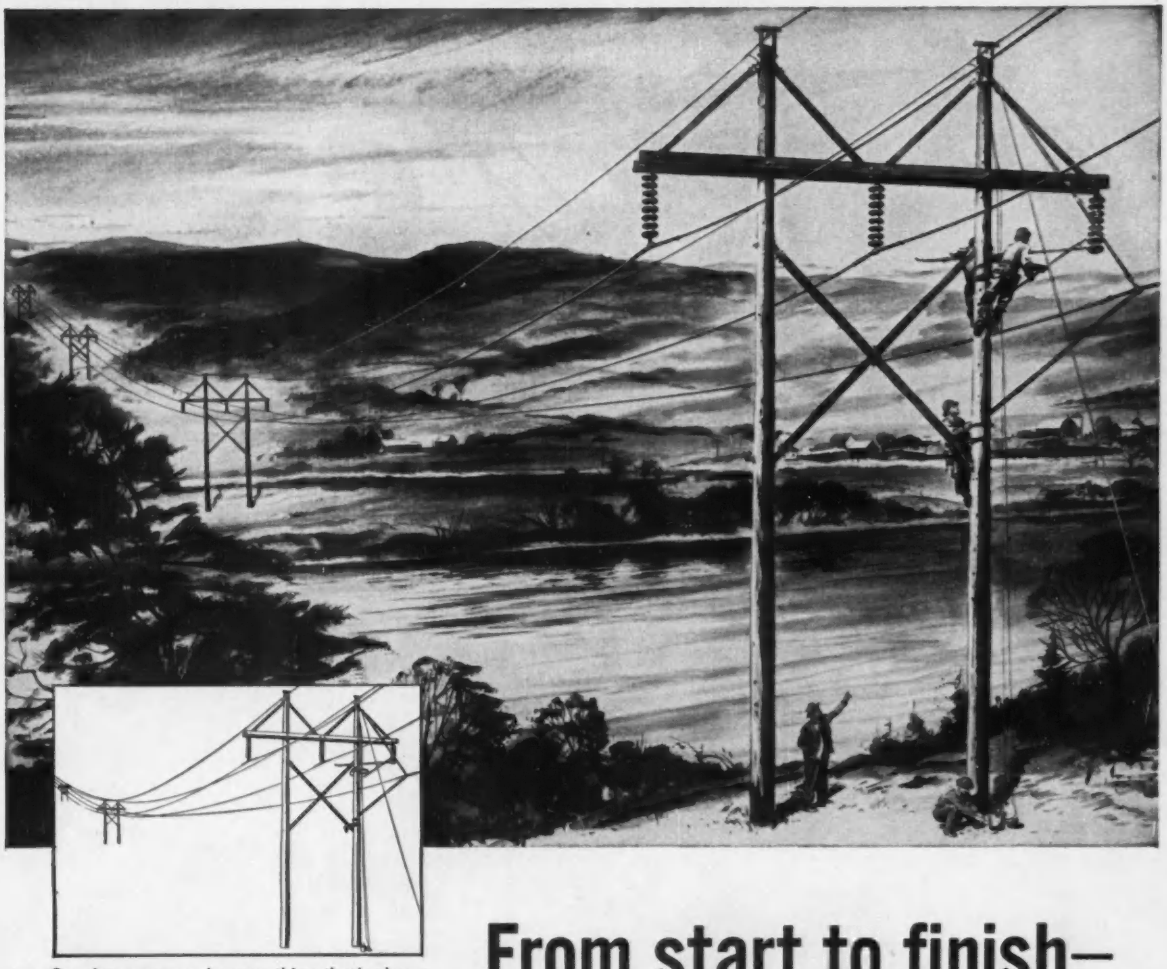
Offices and Distributing Centers Coast-to-Coast

for quality and service... **specify GENERAL CABLE**



Graybar can supply everything that's shown above — except linemen and scenery — for line construction and maintenance. Poles, crossarms, hardware, tools—a partial list of items that are stocked at strategic Graybar locations throughout the country. All available for fast delivery to you. It pays to call Graybar . . . *first.*

From start to finish—
arrange for continuing supplies and equipment—with Graybar

Engineers deep in the problems of new transmission *line construction* must be able to depend upon reliable, on-time deliveries to keep their schedules. And later, to meet the continuing task of *line maintenance*, the selection, dependable delivery and warehousing of supplies and equipment are vital.

Graybar backs up design and construction engineers to speed up these processes. Through more than 130 offices and warehouses, Graybar supplies prompt catalog information on everything electrical needed in line construction and maintenance.

To speed up the selection and delivery of anything and everything you need for line construction and maintenance call Graybar first. *Graybar Electric Company, 420 Lexington Avenue, New York 17, N. Y.*

713

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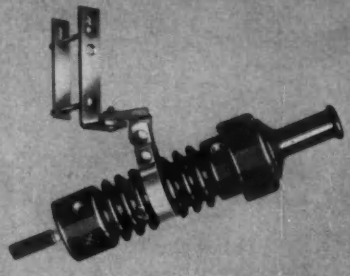
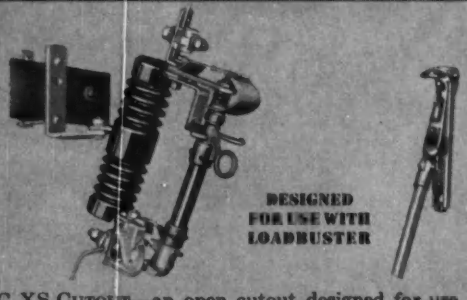
For every distribution system:

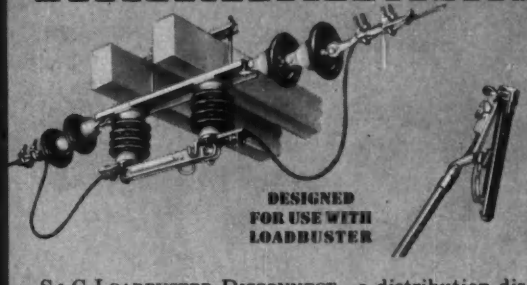
Four devices for low cost load switching at today's higher voltages and loads



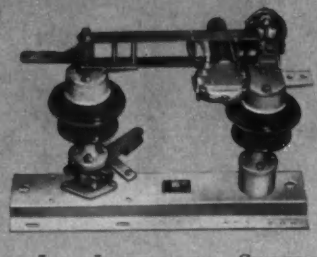
S&C POSITECT—enclosed cutout for full load switching, up to 200 amperes at 5 kv (or as a disconnect—unfused—to 300 amperes). Continuous rating: 50 and 100 amperes as cutout, 100 and 300 as disconnect. Note interrupter attachment at left.



S&C XS CUTOUT—an open cutout designed for use with LOADBUSTER®. Rated 100 amperes continuous as a cutout or 200 amperes continuous with disconnect blade. With LOADBUSTER it will switch full load, and associated charging and magnetizing currents.



S&C LOADBUSTER DISCONNECT—a distribution disconnect, with full published ratings and station-type performance. Rated 15 kv, 400 amperes continuous, 20,000 amperes momentary—95 kv or 110 kv BIL. With LOADBUSTER it can switch all loads, and associated charging and magnetizing currents.



S&C ALDUTI LOAD INTERRUPTER—SIDEBREAK STYLE—three-pole load switching device of long recognized capability. Used primarily for key sectionalizing points. Will interrupt all loads through 600 amperes. Made in 7.2 and 14.4 kv ratings.

S&C ELECTRIC COMPANY

Load switching is a real concern in modern distribution systems, with line voltages of up to 14 kv and load currents as high as 600 amperes. At these voltages and loads, it is impossible or extremely hazardous to open main or branch feeders with ordinary disconnects and cutouts.

Dropping all loads at the source, simply to open a single branch feeder, results in intolerable service interruptions. One alternative—switching with link-break cutouts—is an undependable makeshift. Another alternative—group operated disconnects—still doesn't bring full positive load switching, and is costly.

The S&C solution is a complete "stable" of distribution cutouts, disconnects, and load interrupters—all capable of providing full load switching, at prices to match distribution system economics.

The POSITECT Enclosed Cutout has its own load interrupter attachment. Two other devices—the XS Open Cutout and the Tool Operated Disconnect—are designed to take S&C's portable loadbreak tool, LOADBUSTER®. Finally, the S&C ALDUTI Load Interrupter has a built-in interrupting unit. This reliable interrupter switch has been the standard of the industry for many years.

For additional information on how to give your distribution system universal load switching capability, write to S&C.

S&C Electric Company
4421 Ravenswood Ave.,
Chicago 40, Ill.

In Canada: S&C Electric
Canada, Ltd.
8 Vansco Road,
Toronto 14, Ontario

Disconnects • Cutouts • Fuse Links • LOADBUSTER • Power Fuses • Interrupters • Metalclad Switchgear

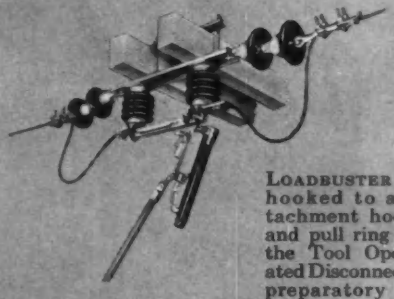
Specialists in High-Voltage Circuit Interruption Since 1910

LOADBUSTER®...

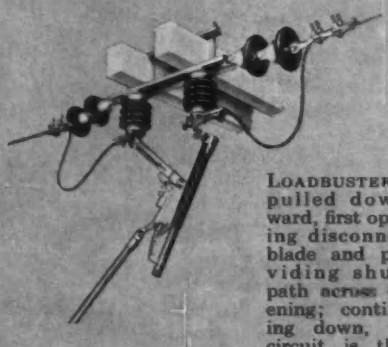
S&C's portable loadbreak tool

This new portable loadbreak tool is used at the end of a universal hook stick for opening disconnects and cutouts designed for use with it. On today's heavy loads, to 400 amperes, and up to 15 kv, this device gives arc-free load switching.

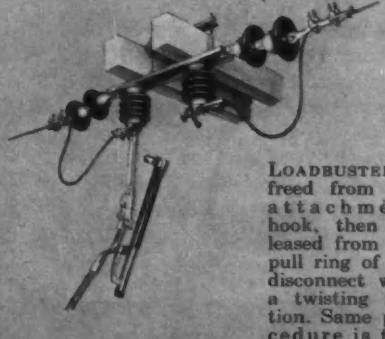
S&C manufactures two distribution devices mated to LOADBUSTER, the Tool Operated Disconnect and the XS Open Cutout. The sequence below illustrates LOADBUSTER opening the S&C Tool Operated Disconnect.



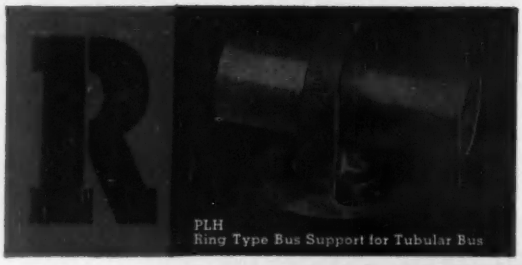
LOADBUSTER is hooked to attachment hook and pull ring of the Tool Operated Disconnect, preparatory to opening.

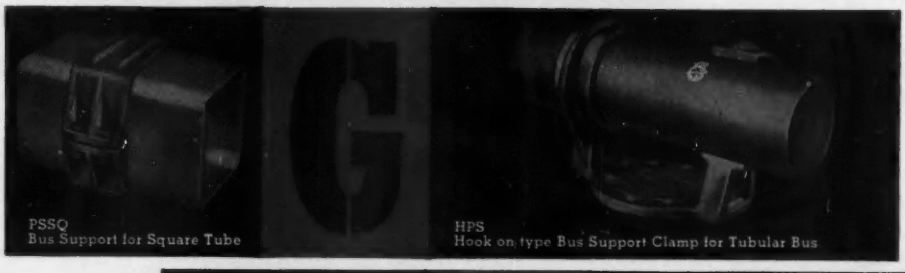


LOADBUSTER is pulled downward, first opening disconnect blade and providing shunt path across opening; continuing down, the circuit is then interrupted in LOADBUSTER, which latches open.



LOADBUSTER is freed from the attachment hook, then released from the pull ring of the disconnect with a twisting motion. Same procedure is followed for cutouts mated to LOADBUSTER.





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• Higher cantilever strength • Higher impact resistance
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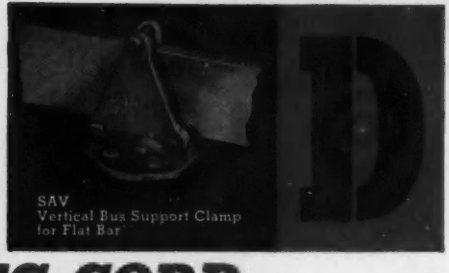
These Dossert Bus Supports are made of a high tensile strength cast bronze alloy and are equipped with silicon bronze bolts and nuts, making the entire unit completely non-magnetic. Available for all sizes and types of busses. Dossert Bus Supports can also be furnished in Coupling, Tee Connecting, Elbow Connecting, Tee Coupling and Expansion Connection types.



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The Electrical Week

FUTURE NEWS ▶ **Watch for some utility common stock splits** if the strong market continues. Several companies' share prices are high enough now.

LATE NEWS ▶ **State Department appoints Howard W. Cooper,** vp and assistant to chairman of Minnesota P&L, as U. S. delegate to a series of power meetings in Geneva. Series will be held Oct. 6-10 under auspices of UN Economic Commission for Europe's Electric Power Committee.

American Electric Power expands 704 computer use to include transient stability studies. Computer plots actual swing curves of industrial customers' motors, reduces required study time by 500 to 1.

Pacific G&E joins Public Information Program. The big California utility brings PIP's meter representation up to 22,908,000.

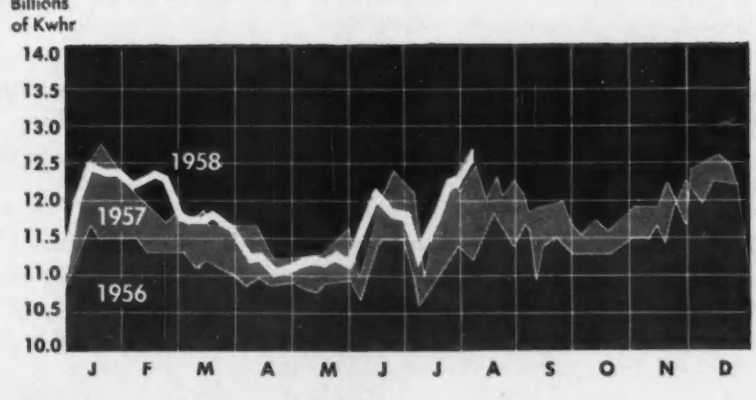
Soviet scientific and technical journals now available in English. National Science Foundation says about 60,000 pages a year are translated through efforts supported by four government agencies and six commercial firms working without government support.

Gallup poll shows "Live Better Electrically" theme scored highest among a group of other industry-wide themes in a national study. Results: 82% of adult Americans are familiar with LBE slogan.

Management changes . . . C. H. Bolton becomes vp and treasurer of Nantahala P&L, succeeding H. H. Gnuse, Jr, who joins Aluminum Co of America as senior power engineer . . . Pennsylvania P&L appoints Barlow Van Ness, Jr, to chief electrical engineer, succeeding W. B. Morton, deceased . . . Rome Cable elects Allan M. Ziegler vp.

Electric output hit a record 12,619,000,000 kwhrs for the week ended August 2. This compared with the former record of 12,570,000,000 kwhrs for the week ended Dec. 14, 1957.

POWER OUTPUT—Up 1.2% (Week ending August 2), Kwhr 12,619,000,000



Per Cent Change From Previous Year

	July 19	July 26	Aug 2
Total U.S.	−0.4	+0.6	+1.2
New Eng.	+2.3	+1.4	+2.5
Mid. Atlantic..	+3.1	−0.6	+3.9
Cent. Ind.	−2.6	−3.0	−3.1
West Cent....	−11.3	0.0	−7.2
Southeast	+3.5	+3.7	+6.3
South Cent. ...	+2.0	+8.6	+5.9
Rocky Mount...	+7.6	+8.1	+5.6
Pacific			
NW	−14.3	−13.7	−11.9
SW	+0.7	+2.6	+3.0

Seasonally Adjusted Index 235.1

Week Ago 230.8 Year Ago 233.7

Source: Edison Electric Institute

A TWO-MINUTE PREVIEW OF THIS ISSUE

EVENTS ▶ **Supporters of TVA self-financing bond program received a setback** last week. Their plan to put the Authority on a self-governing bond financing program, already approved by the Senate and the House Public Works Committee, was pidgeonholed by the House Rules Committee. The bill looks dead for this session, but there is a slight chance it may be brought directly to the House floor by the seldom-used tactic of "suspending the House rules." (p 34).

REA loans to make rural electric co-ops competitive with private power could be forbidden as a result of a potentially far-reaching finding by the U.S. Comptroller General. As most Washington experts read it, this finding could jeopardize the legality of many present REA loans, block most future loans for expansion, and bar REA co-ops from serving any customer that a private utility says it is willing to serve (p 35).

APPLIANCE LOADS ▶ **Want an idea of how the operation of major appliances** affects your load curves? At what hours home freezers, dishwashers, television sets, automatic washers, and clothes dryers are most used? Here are the first published facts about one of the most extensive surveys ever made of appliance load characteristics. For instance, you'll find that TV peaks at 9:00 PM, with more viewers in December than in June; that dishwashers get more use at 8:00 PM than any other time; that freezers have a uniform monthly load factor; and that there really is a "washday Monday" (p 40).

GENERATION ▶ **Stream pollution has been attributed** to some reservoir-fed hydroelectric plants; yet these plants discharge no waste into the water. Lowered oxygen content of turbine discharge water is the basis for complaint. What is the process at work which can deprive aquatic life of the oxygen it needs to survive? (p 52)

TRANSMISSION ▶ **Protection against contamination of the unit** is designed into a new Fogbowl suspension insulator for use in areas subject to salt fog or industrial contamination (p 47).

SUBSTATIONS ▶ **Appreciable savings** result from use of standard circuit breaker foundations and adapter plates welded to breaker legs by Long Island Lighting Co (p 48).

DISTRIBUTION ▶ **An aerial cage** attached to the boom of a yard crane expedites maintenance of exterior lighting fixtures and also extends the usefulness of the crane. The $25 cage took four hrs to assemble; saves Indiana-Kentucky Electric Corp $400 per yr (p 48).

RATES AND REGULATION ▶ **1958 rate hikes already top last year.** Through July more than $68 million annually in rate increases had already been granted to power companies, and the total may swell to $100 million before the year is out. Most regulatory bodies have gone along with the utilities' appli-

cations, realizing that costs are rising much faster than rates; but Rhode Island turned down Narragansett Electric Co's first bid for a rate increase in 37 years (p 81).

EMPLOYEE TRAINING ▶ **"Interest-rate" is as important as "heat-rate" to some engineers** in training at Commonwealth Edison, for the company is teaching them engineering economics. The utility believes rates of return, depreciation, taxes and other factors strongly influence engineering applications. Learn how Commonwealth Ed has trained "dollar-wise" engineers (p 37).

SELLING ▶ **"Shower after shower after shower"** is one of the slogans Detroit Edison is using to pound home its "plenty of hotter hot water" idea to homeowners. The utility has launched a $1/3 million campaign to put 100,000 new, quick-recovery, electric hot water heaters on its lines by 1962. It's all part of a long range promotion drive to boost kwhr sales through the sale of major electric appliances (p 36).

How do you sell electricity to women when it doesn't come packaged, bottled, bagged, or styled? When it can't be eaten, worn or smoked? Wisconsin Power & Light Co's answer—a "supermarket" ad listing food items and the price of electricity to prepare them—is creating quite a stir in utility sales circles (p 78).

MANUFACTURERS ▶ **An atomic reactor simulator** that precisely duplicates operation of Argonne National Laboratory's boiling water reactor has been built for AEC (p 56) . . . Water thinned insulating varnish, an emulsion, will neither burn nor support combustion (p 65) . . . EW gives you a peek at a few new products, including pre-insulated connectors for underground cables, a 200-amp socket meter mounting incorporating a bypass for the meter when making a change, and a centralized control system for unattended power stations and substations (p 65) . . . Some manufacturers' sales and earnings are reported for the half ending June 30 (p 66).

NEW EQUIPMENT ▶ **Pneumatic interrupter control provides remote or automatic operation** of HPL-C metal enclosed interrupter switches in ratings of 600 to 2,000-amp, 2.4 to 14.4-kv . . . Distribution transformers in single phase, pole-type line are completely redesigned to have improved electrical characteristics, lighter weight and easier maintenance . . . Disconnect uses epoxy resin to provide positive bond between metal parts and wet process porcelain housing (p 68).

PEOPLE ▶ **Theron A. Brown has been elected president** and general manager, and William A. McNamara has been made vice president-finance by Madison Gas & Electric Co . . . E. I. Hatch has risen to executive vice president and member of the board, and E. A. Wilson has been elected vice president at Alabama Power Co . . . Henry L. Bowen has been promoted to vice president of Georgia Power Co (p 85).

It is difficult to compare reactor types because of variations in turbine design, operating pressures, feedwater, and other design parameters. But adjusting them to a common basis reveals that liquid-metal cooled reactors have the greatest steam-cycle efficiency and gas-cooled reactors the least. Boiling-water reactors require the least auxiliary power. And the best overall efficiency is that of a fast breeder using three feedwater heaters.—**S. Baron, Nucleonics, June 1958.**

TECHNICAL NOTES

When using telemetering over leased telephone facilities consideration should be given to the frequency or pulse rate used to realize benefits offered by the American Telephone & Telegraph Co for low-frequency operation.

Excessive instantaneous increase of load presents a real hazard to turbines because of the possibility of water carryover. To prevent this by limiting any sudden pickup to a safe value, the turbine mechanical load limit devices should be set above the normal maneuvering range of the unit.

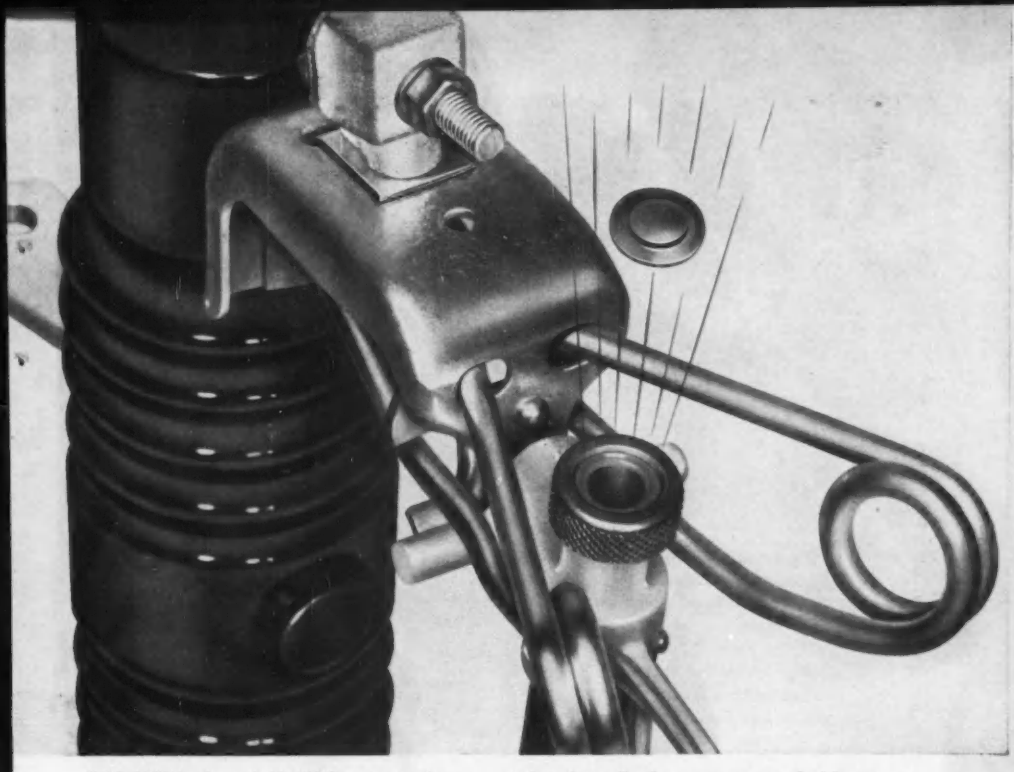
Arcing ground fault currents of 5 amp cause some welding of generator laminations. But the damage is not regarded as serious enough to require major repair.

Coating or other treatment of graphite may make carbon dioxide suitable for high temperature operation in gas-cooled, enriched uranium reactors.

FROM EDITORS IN THE FIELD

A 38-mile coal pipeline is under construction in Russia. Cost of pumping coal to a power plant, the Russians say, will be three times cheaper than shipping by rail.

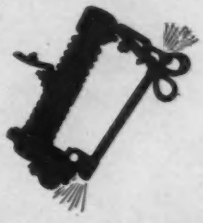
Construction of a 3.5 Mw geothermal power plant powered by natural steam is underway in Mexico. Government engineers indicate that there are 100 hydro thermal zones where such plants are possible in Mexico.



TOP VIEW of an L-M HDO cutout, showing operation of the L-M-developed expendable cap on a high amperage fault. The high pressure lifts the lid of the expendable cap, rather than bursting the fuse tube. Actually the cap very rarely blows—one utility says in 2% of the cases at most; another has never had it happen. In any case, most utilities agree that the expendable cap provides good, low-cost insurance.

How It Works

On low amperage faults, the tube provides ample pressure for fast arc expulsion by single-venting at the bottom of the cutout.



On high amperage faults, the cap at the top opens instantly, releasing the pressure by venting at both ends of tube.

L-M Cap Secret Of Economical Extra-Duty Open-Type Cutouts

L-M's development of the expendable cap principle in 1950 solved the problem of handling both high and low amperage faults in open-type cutouts. Thus it is possible to produce a cutout that performs well at all values of current up to the "extra-heavy-duty" ratings. On low amperage faults, the small-bore tube develops ample pressure to expel the arc. On high amperage faults, the pressure opens the lid of the cap, releasing the pressure instantly without danger of tube rupture. While this seldom happens, in perhaps one to two percent of the operations—the cap is there, and performs when needed. Thus the L-M cap provides low-cost insurance.

L-M Now Licensing Other Manufacturers

Since this L-M invention is the only practical solution to the problem that has been found, L-M is now licensing other manufacturers to use the L-M expendable cap. So when you buy open-type cutouts—of *any* make—look for the expendable cap that economically provides for successful interruption of all current values. These caps are standard on L-M HDO open-type cutouts—the outstanding and original controlled, double-vented cutout.

Don't Flip Your Lid—Let the Cutout Do It

True—it's rare that you need the extremely high interrupting capacity the expendable cap provides. But it's there when you need it—and the cap eliminates the danger of bursting fuse tubes. Get complete information on L-M Type HDO open cutouts from your L-M Field Engineer; or write for HDO Bulletin to Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

Some L-M Cutout "Firsts"

L-M has been the outstanding leader in the development of fuse cutouts. Here are some well-known L-M "Firsts."

1. First wet-process porcelain box, replacing wood boxes.
2. First formed-section fuse links, giving better accuracy—now used by most link manufacturers.
3. First dropout cutouts—with tube dropping to indicate a blown fuse.
4. First phenolic-covered fibre tubes. Covering prevents warping.
5. First open-type fuse cutout.
6. First repeater cutouts (open and enclosed) to help maintain service continuity.
7. First bi-metal fuse links, providing better fusing (high surge) characteristics than the single metal links previously used.
8. First "heavy-duty" porcelain-housed cutouts.
9. First "extra-heavy-duty" porcelain-housed cutouts.
10. First complete porcelain-housed cutout family with interchangeable doors to meet changes in system requirements.
11. First link-break type, load-current-interrupting cutout.
12. First controlled double-vented open-type cutouts, made possible by the L-M development of the expendable cap—now available by license agreement to other companies, as are many other of these L-M "Firsts."

LINE MATERIAL Industries

McGRAW-EDISON COMPANY

fuse cutouts and fuse links

McGRAW EDISON

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

L-M's "HDO" open-type cutouts provide greater system reliability. The bird-proof design, rugged construction, and high interrupting capacity built into the cutout assure long, trouble-free service.

How L-M "HDO" Open-Type Cutouts Handle Both High and Low Faults

L-M's controlled double-venting principle provides positive pressure control—an outstanding advance in fuse cutout design.

by **M. L. FENNIG**
Sales Application Engineer,
Protective Equipment,
Line Material Industries

Fuse cutout design has always been something of a compromise. To assure expulsion of arcs from low-amperage faults, the tube must provide small volume to build ample pressure. Yet this same tube is subject to sudden rupture from the rapid development of large gas volumes from high-amperage arcs. L-M's controlled double-venting principle provides the best solution to this problem known at the present time.

Positive Pressure Control

A unique feature of L-M's "HDO" cutout is the pressure-controlled double-venting cap. On low-amperage faults, gases are vented from the bottom of the tube only. This allows sufficient pressure to build up in the tube to assure consistent, reliable arc interruption of faults of the smallest magnitude.

On high-amperage faults, where pressure relief is needed, the diaphragm in the heavy-duty cap opens at the top to allow double venting. The double venting reduces the stress on the cutout, eliminating the possibility of bursting the tube on high-amperage faults. This assures dependable operation, and greater safety for the lineman. Gases from the top are vented vertically to avoid gases from the bottom. This minimizes possibility of contact flashover.

L-M's "HDO" cutouts are strong, durable and easy to operate. They provide the greatest system reliability and lowest operating and maintenance cost of any cutout on the market today. Here's why.

Lower Resistance Path

All current-carrying parts are made of heavy-duty solid copper or copper alloy and are silver-plated to assure cool operation even after many years of service. In addition, the "HDO" has a minimum number of current-interchange points in the circuit, from line lead to the load lead. This provides ample capacity without overheating for years to come.

Greater Resistance to Corrosion

L-M uses high-strength, low-alloy corrosion-resistant steel, such as Cor-Ten, for all non-current-carrying parts, except the hanger. Cor-Ten steel has a yield point at least 1½ times that of structural steel and about twice that of mild carbon steel. Its ability to withstand atmospheric corrosion is 4 to 6 times greater than mild steel.

The results of a 16-year test, shown in the curves, prove the superior corrosion resistance of the low-alloy corrosion-resistant steel hardware furnished with L-M's "HDO" cutout.

Other Outstanding Features

- The "HDO" offers many other desirable features:
- Top contacts and center hanger mounting have through-bolts with insulated heads to provide complete bird-proof protection.

LINE MATERIAL Industries
McGRAW-EDISON COMPANY

Distribution Class Single Insulator Type

L-M's standard mounting "HDO" cutouts are rugged, easy to operate with hook-stick. All current-carrying parts are silver-plated to assure cool operation.

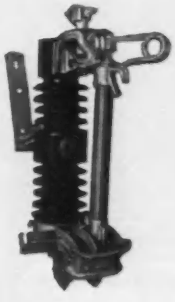
Two Insulator Type

Distribution post insulator mounting of L-M's "HDO" cutouts provides additional creepage distance for applications in industrial and coastal areas.

Complete Line of Open-Type Cutouts from 5.2 kv to 27 kv

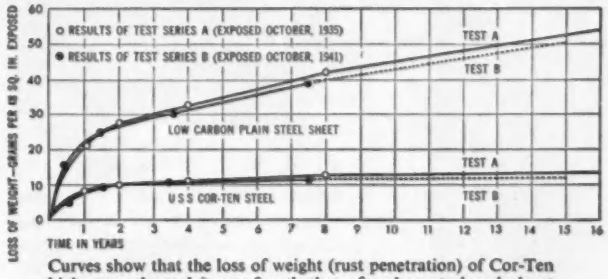
Power Class

Substation mounting is also available. L-M's "HDO" cutouts provide high interrupting capacity, economical fuse replacement, easy operation with a hook-stick and long life.



Load Break

Easy pulling action of interchangeable load-break cartridge will break the link. Arc interruption is completed inside the tube, assuring fast, safe switching of either inductive or capacitive load currents. Available in 5.2, 7.8, 15 and 27 kv ratings.


LOSS OF WEIGHT—GRAMS PER 18 SQ. IN. EXPOSED
TIME IN YEARS
○ RESULTS OF TEST SERIES A (EXPOSED OCTOBER, 1935)
● RESULTS OF TEST SERIES B (EXPOSED OCTOBER, 1941)
TEST A
TEST B
LOW CARBON PLAIN STEEL SHEET
TEST A
TEST B
U S S COR-TEN STEEL
0 10 20 30 40 50 60
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

Curves show that the loss of weight (rust penetration) of Cor-Ten high strength steel is one-fourth that of carbon steel and about one-third that of copper steel after 16 years exposure to *severe* industrial atmospheric conditions. Steel of this type is used for all non-current-carrying parts of the "HDO" except the hanger.

COR-TEN is a registered trademark of U. S. Steel Co.

SIZES AND RATINGS

Cartridges	Interrupting Capacities, Amperes 5.2 KV	7.8 KV	15 KV	27 KV
Normal-Duty Single Venting (Solid Cap)				1200 A.
Heavy-Duty Double Venting (Heavy-Duty Cap)				4000
Heavy-Duty Single Venting (Solid Cap)	5000	5000	4000	
Extra-Heavy-Duty Double Venting (Heavy-Duty Cap)	10000	10000	8000	

- All cartridges are designed for easy hook-stick removal and replacement.
- Top contacts are husky, hard-drawn copper, silver-plated. They serve as guides so the tube cannot miss top contacts.
- Cartridge is firmly anchored; the tube cannot move upward, even when it is accidentally closed in on a fault, within its rating.
- Cutout interrupts any fault current, from minimum melting of link to maximum interrupting capacity of cutout, *with any size link.*

Complete Line of Cutouts

L-M offers a complete line of cutouts in 5.2, 7.8, 15 and 27 kv classes, with a full line of fuse cartridges in normal, heavy, and extra heavy-duty interrupting rating, switch blade, and interchangeable load-break cartridges. All cartridges (except the 27 kv) use standard 20-inch distribution fuse links.

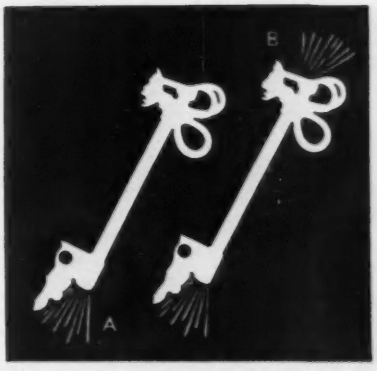
Interchangeable Load-Break Cartridge

Line Material's "HDO" open-type cutout has optional interchangeable load-break cartridges available in each voltage class and interrupting rating.

A pulling force of less than 30 pounds is required to break the largest size link. The cartridge is designed to interrupt all capacitive and inductive loads up through 100 amperes and to completely extinguish the load current in the tube. With L-M's simple load-break device you can switch loads or sectionalize distribution circuits quickly and easily with very little increase in your cutout investment.

Get Complete Information

Ask the L-M Field Engineer for bulletins and complete information about L-M's full line of open and enclosed fuse cutouts and other protective equipment. Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.



How Double Venting Controls Pressure

On low-amperage faults, ample pressure is provided to insure fast arc extinction, by single venting at the bottom of tube, *A*.

On high-amperage faults, heavy-duty cap at top (*B*) opens so that pressure is vented at both top and bottom of tube, providing greater safety by eliminating tube rupture. Note that the gases from the top are vented vertically—not horizontally. This eliminates danger of contact flashover.

fuse cutouts and fuse links McGRAW EDISON

1. Porcelain bushings—which, with air insulation, give high impulse and corona levels, and greater permanent creepage strength than phenolic insulation.
2. High location of main bus permits normal operation in flood areas. Units can operate in over 2 feet of water without damage or service interruption.
3. Recloser primary and secondary connections are automatically made as recloser is raised into operating position. Bushings on recloser have special flexible self-aligning disconnects.
4. One of a number of troughs provided for low-voltage wiring.
5. Type W Recloser. Type R may also be used where loads are smaller, and changed to Type W when situation necessitates.
6. Compact—takes from 10 to 25% less ground area (and a smaller pad), and 25 to 35% less volume than comparable metal-clad equipment.

REAR VIEW of feeder unit with all panels removed.

HYDRAULIC LIFT TRUCK. Recloser is easily removed, or inserted and locked into operating position. Mechanical interlocks make it impossible to insert recloser into primary contacts unless recloser is in OPEN position.

Let's Clear Up "Clearing Time"

The published time-current characteristics for Kyle oil circuit reclosers include the *total* time, from instant of fault initiation to the completion of arc extinction. This includes the complete fault sensing period, tripping time, and sufficient contact travel time for complete interruption.

Since the fault sensing and timing means is incorporated within the Kyle recloser, this recloser is independent of external devices, which themselves may add appreciable time to the operating time claimed for other devices.

Thus the 2 or 2½ cycles in which Kyle reclosers clear faults is appreciably less time than that required by devices usually incorporated in metal-clad equipment. Therefore, Kyle switchgear gives much better protection to conductors, and much better insurance of service continuity.

THE NEW KYLE-KLAD SWITCHGEAR is designed so that the basic unit is simple, functional, and extremely economical, offering substantial savings over traditional metal-clad. But the design also makes possible a wide choice of variations, optional arrangements, and accessories to suit almost any requirements.

Kyle-Klad Metal-Enclosed Reclosers Offer Many Outstanding Features

Faster Clearing...Better Coordination...Lower Cost ...Porcelain-and-Air Major Insulation...Space Savings ...Provision for Future System Planning

FRANK McSTAY demonstrates accessibility of the meter compartment. The attractive low-line appearance of the Kyle enclosure makes it very desirable for urban areas. The unit is completely weatherized with phosphatized treatment, primer, and two coats of alkyd resin paint. Ventilators allow circulation of filtered air. Heaters prevent condensation of moisture.

by **FRANK W. McSTAY**, Product Manager
Kyle Switchgear, Line Material Industries

All of the well-known advantages of the Kyle Type W or Type R reclosers, plus simple, functional design, are now available in the new L-M Kyle-Klad metal-enclosed switchgear.

Cost As Low As $4,540

The units are simple and compact. They are highly efficient, and provide many advantages, at a substantially lower cost than that of the traditional metal-clad units. For example, the basic 15 kv 110 BIL feeder unit costs only $4,540.

Fastest Clearing Time

The reclosers themselves provide the fastest clearing, from fault initiation to arc extinction, of any device on the market. This high-speed clearing gives better protection to conductors against burndown and annealing, and thus assures better service continuity. Timing of the recloser is accomplished by self-contained time delay mechanisms which have indexed settings for specific time current characteristics. Kyle's usual wide choice of time current characteristics is available.

The units are quite flexible in many respects. There is a wide choice of optional equipment. Future expansion is easily handled, by either changing reclosers or adding additional feeder units. Space is provided in the auxiliary compartment for lightning protection. Many other features and options are available.

The units are compact, and installation is simple. They require less pad area, and therefore, less concrete. Fewer man-hours are required for installation, offering additional savings. Thus Kyle-Klad equipment offers savings you cannot afford to ignore.

Get This Bulletin and Details From The L-M Field Engineer

Or write Mr. McStay at Kyle Products Division, Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

LINE MATERIAL Industries

McGRAW-EDISON COMPANY

Kyle® Switchgear

McGRAW EDISON

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DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

Both initial and periodic tree trimming are cut to an absolute minimum with Rome's preassembled aerial cable.

Fast, efficient installations, even in densely wooded areas, are possible with Rome's preassembled aerial cable.

Trim your tree-trimming costs with Rome's preassembled aerial cable

Stringing power lines, especially through wooded areas, need not be a time-consuming, expensive installation. Not if you use Rome's preassembled aerial cable.

Because of the staunch characteristics of preassembled aerial cable, both initial and periodical tree-trimming time is cut way down. Initially, you need not clear as much of a right of way for preassembled aerial cable as is necessary in the case of open-wire construction. Periodic tree trimming can be put off for as long as five years, in some cases. This is compared to a normal two-year requirement for open-wire construction.

In residential areas, tree trimming can be a problem. Home owners, who have an inherent interest in the trimming of trees which grace their property, are very interested in the amount of trimming that is necessary. When using Rome's preassembled aerial cable, it is not necessary to disturb the trees as much as in the case of open-wire installations.

In addition to the tree-trimming advantages of Rome's preassembled aerial cable, there are many other "reliability" factors which you get by specifying this particular type of cable installation.

Improved Voltage Regulation

Aerial cable, because of its close geometric spacing as compared with open-wire circuits, has a lower reactance. Voltage drop is about half as great as typical crossarm construction. Similarly, for a given allowable voltage drop, power can be transmitted twice as far.

Storm Protection

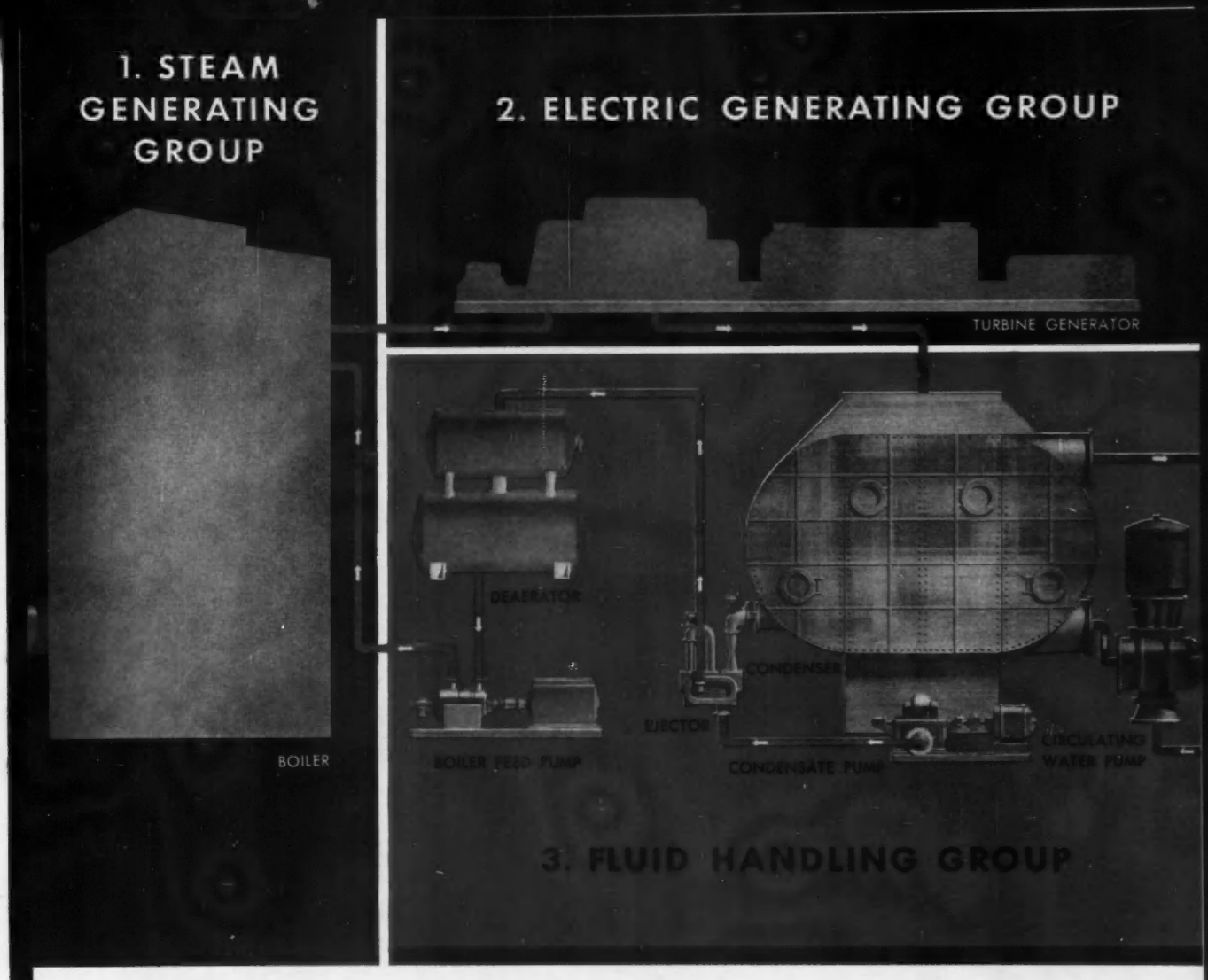
You can reduce your storm maintenance costs due to the strength of preassembled aerial cable. Falling branches, or even trees, can be supported by the cable itself.

Other features of Rome's preassembled aerial cable include (a) practicality of mid-span tapping (because of reverse-lay construction); (b) improved appearance (elimination of pole crossarm hardware, in many cases); and (c) simplicity of installation.

Use Rome's preassembled aerial cable the next time you have to extend your power distribution lines. Your job will be easier and you'll save labor and maintenance expense. For more information on this product, call your nearest Rome Cable representative—or write to Department 770-B, Rome Cable Corporation, Rome, New York.

ROME CABLE

CORPORATION



LOOK AT ALL THREE FOR POWER

Power plant reliability often depends on the effect of one component of the *Fluid Handling Group* on another. As the manufacturer of all major components of this group, Worthington has a reservoir of experience and knowledge that can benefit you. This "system-wise experience" with modern complex plant equipment can help solve your fluid handling problems. To put "system-wise experience" to work get in touch with your nearest district office. Worthington Corporation, Harrison, New Jersey.

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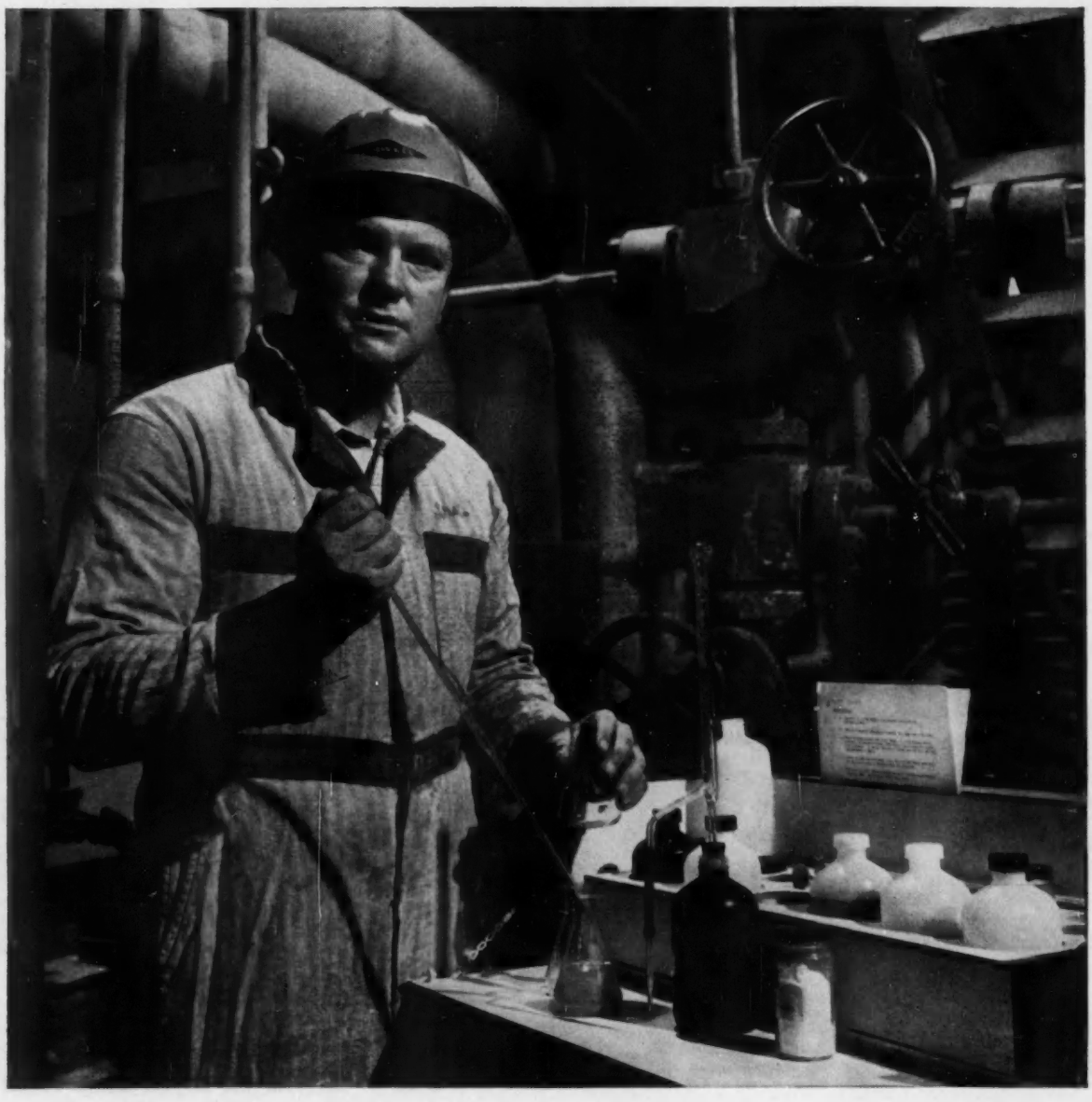
WORTHINGTON



THIS MAN CAN ADD TO YOUR PROFIT PICTURE. This is a Dowell service engineer—on the job. His knowledge and abilities in chemical cleaning can help you to greater profits. Recently, an eastern corporation used Dowell Service for its boiler cleaning maintenance. Dowell's service engineer studied the problem, did the job. His use of chemical solvents in cleaning tubes and other metal surfaces was effective. On the basis of Dowell Service, this company will realize improved profits of $440,000.

There are three ways you can clean your plant equipment: *Mechanically* with your own crews—inefficient, time consuming and expensive in today's industrial pace. *Chemically* with your own crews—again inefficient and unprofitable because of heavy payroll and the personnel's lack of qualification. Or with *Dowell Service*, the modern chemical cleaning method.

With Dowell Service you receive the benefits of more than fifteen years experience in chemical cleaning—plus special equipment, chemicals, research and trained personnel. You pay one charge, get an efficient job, handled by knowledgeable people.

Every industry can profit from Dowell Service. Ask your maintenance and operating engineers if they have thoroughly investigated the profit possibilities of using Dowell Service. DOWELL—A SERVICE DIVISION OF THE DOW CHEMICAL COMPANY. Headquarters and research center, Tulsa, Oklahoma; 165 offices and stations to serve you.

Chemical cleaning service for industry DOWELL

new look
HIGH STRENGTH insulators

COLOR CODING makes high strength insulator identification quick and positive at a glance . . . what this means to you ▶▶

Progress Is Our Most Important Product

GENERAL ELECTRIC

NEW COLOR CODING takes the guesswork out of insulator identification!

BROWN 15,000 LB. | GRAY 25,000 LB. | AVOID THIS

Color coding offers a positive, at a glance solution to the presently existing industry wide intercoupling problem for 15,000 lb. and 25,000 lb. suspension insulators. Continuous ceramic research has produced a new gray glaze. This insures equally high impact and mechanical strength to our time proven mahogany high compression glaze.

This General Electric *progress* simplifies insulator identification in the crate, at the warehouse, on the line trucks, during field assembly, and on the line in service. Color coding makes insulator identification immediate and foolproof for the stock clerk, the inspector, and the lineman. It can mean time saving and peace of mind in your operations. Thousands are already in use.

Simplifies Line Patrol

The neutral gray appearance provides a natural protection against promiscuous "target hunters." In addition, laboratory tests show that flashover burns are readily detectable from ground or air. The gray compression glaze affords a distinctive contrast with the white underporcelain for breaks or burns.

COLOR CODING denotes High Strength-High Quality

New color coding on our high strength 25,000 lb. units changes the insulator in appearance *only*. The same *high quality mechanical* and *electrical* characteristics of our high strength porcelain are retained with the new gray color. Yes, the price is the same, too.

Color coded gray insulators are available in all three spacings (4¾", 5", and 5¾") of our new XHS 25,000 lb. suspension insulators (*Locke Cat Nos. 18253, -4, and -5). For additional information about the "*New Look*" in insulators, contact your Insulator Department representative, or write directly to Insulator Department, General Electric Company, P. O. Box 57, Baltimore 3, Maryland.

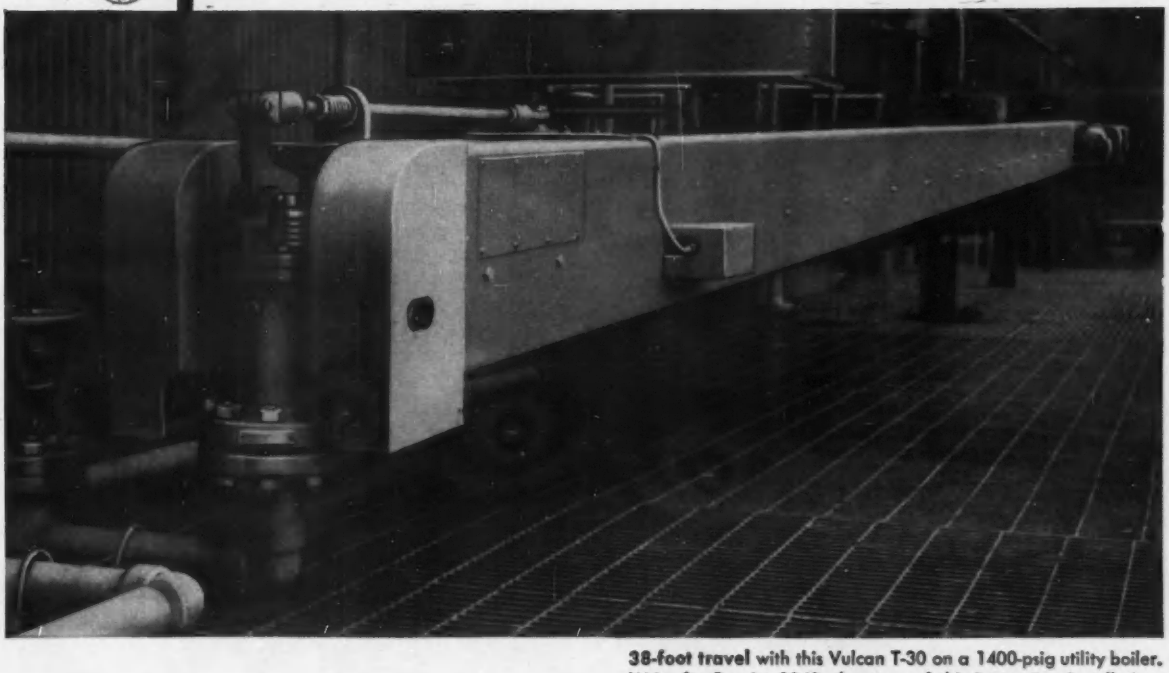
*Trademark General Electric Company

BUY NOW FOR EXTRA VALUES

Progress Is Our Most Important Product

GENERAL ELECTRIC

How Copes-Vulcan control systems boost power plant efficiency



38-foot travel with this Vulcan T-30 on a 1400-psig utility boiler. Write for Reprint 1040, the story of this interesting installation.

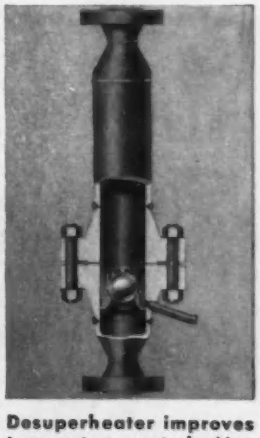
Vulcan soot blowers clean widest furnaces ...simplify maintenance

Vulcan long retractable soot blowers are products of years of experience in the utility field. A dual-motor drive permits one motor to extend and retract the lance, another to rotate it. This provides an infinite number of multi-helix jet patterns for *complete* coverage, *uniform* cleaning.

Built to withstand outdoor installations in all climates, these soot blowers feature simplicity of working parts to assure dependable operation with a minimum of outages for servicing.

One source . . . one responsibility . . . a complete service. Besides boiler cleaning equipment, Copes-Vulcan builds complete control systems for combustion, feed water, superheat and reheat temperatures, feed water bypass, pressure reducing and desuperheating. Whether furnished separately or integrated into a single package, each installation is custom-designed for the specified conditions. Write for Bulletin 1022-B.

Combustion control for every need. Copes-Vulcan combustion control adapts to all generating capacities, load ranges, pressures and fuels. Write for Bulletin 1032, the story of a utility installation featuring compact panel with miniature instruments.



Desuperheater improves temperature control. New Copes-Vulcan Variable-Orifice Desuperheater holds reduced steam temperature constant only twenty feet downstream from desuperheater outlet, even over a 50-to-1 load range. Write for Bulletin 1037.

Copes-Vulcan Division
BLAW-KNOX COMPANY
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When the heat's on...

ROEBLING TELLURIUM LEAD ALLOY SHEATH IS STEADY AND STABLE!

Wiping operations raise sheath temperatures up to 400° F. Stable sheath is what you need when the heat's on! And Roebling's Tellurium Lead Alloy Sheath retains its remarkable creep resistance and bending fatigue resistance under intense heat, and after it.

What's more, there's extra life built into the carefully made paper power cable *inside*. That's why there's simply no better cable buy when it comes to long life, dependable service, minimum maintenance.

Interesting test and other data are now available. Write today for your free copy of the booklet that shows the way to reduced cable and maintenance costs. Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

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THE SANGAMO J2 METER MAKES

23,343,648

FEWER REVOLUTIONS THAN ANY OTHER SINGLEPHASE METER!

The J2 Watthour Meter is the slow speed meter

Figure it out for yourself: If a class 100 meter carried a 100 amp. load day and night, it would measure 210,240 kilowatthours in one year's time. The Sangamo Class 100 J2 Meter, with its 6.0 constant, makes only 166⅔ revolutions to measure one kilowatthour. It would take 35,040,000 revolutions to measure 210,240 kwh. Meters with a 3.6 constant require 277.7 revolutions per kilowatthour and would have to make 58,383,648 revolutions to measure the same 210,240 kwh. That's a difference of 23,343,648 revolutions. Whether Class 100 or Class 200, Sangamo J Meters measure full capacity loads with 40% fewer revolutions.

Fewer revolutions mean less wear on all moving parts . . . and *less wear means longer service life.*

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

JM58-6

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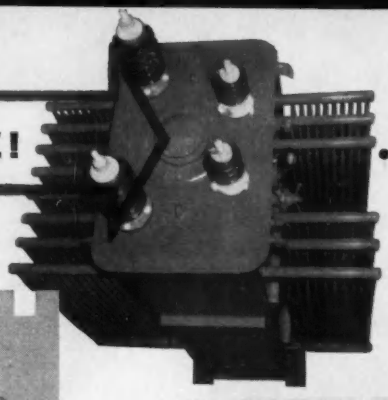

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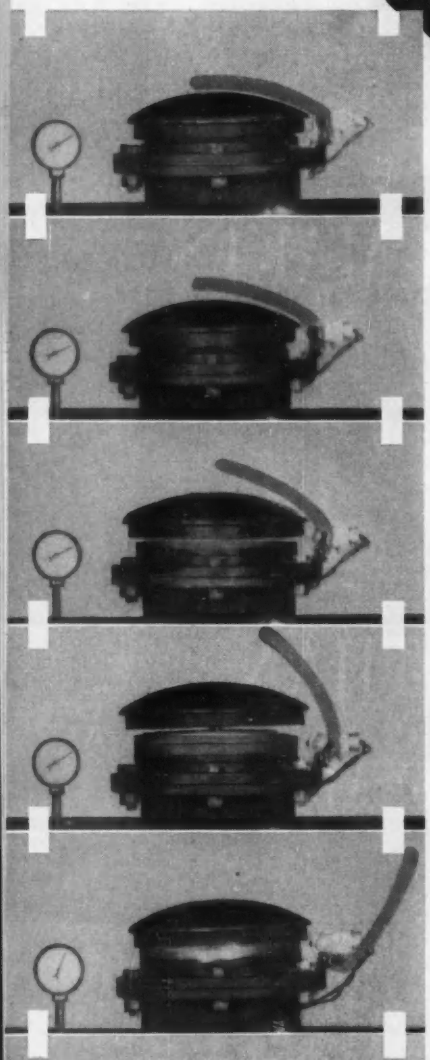
NEW *Positive-acting* PRESSURE-RELIEF DEVICE

- **FULLY AUTOMATIC**
- **SELF-RECLOSING**
- **SELF-RESETTING**



HIGH-SPEED CAMERA SHOWS OPERATING CHARACTERISTICS OF RELIEF DEVICE

These excerpts from a high-speed camera film illustrate both the speed and accuracy with which Pennsylvania's new pressure-relief device operates. In the top frame, 1, the pressure is approaching the predetermined setting (in this case, eleven pounds). In the second frame, the pressure limit has been reached, and the resulting operation is shown in frames 3 and 4. In the bottom frame, 5, the cover is starting to return to the closed position. *The total elapsed time for this sequence was 0.68 seconds.*

The new mechanical pressure-relief device developed by Pennsylvania Transformer engineers is completely automatic. It relieves internal pressure at a predetermined setting by temporarily breaking a gasket seal to permit gas or oil to escape around the cover . . . then *automatically* reseals itself so that the device is again fully effective.

NO PARTS TO REPLACE . . . NO RESETTING NEEDED

By eliminating the glass disc or diaphragm used on ordinary pressure-relief devices, this new Pennsylvania development does away with the time-consuming task of replacing parts. In addition, the need for periodic inspection has been eliminated. There is nothing to break . . . nothing to fall into the transformer . . . nothing to get out of alignment. Highly corrosion-resistant materials are used throughout: anodized aluminum for the cover and flange, and stainless steel for the shaft.

NO BREATHING TAKES PLACE AFTER RELEASE OF PRESSURE

An additional advantage over ordinary pressure-relief mechanisms is that the cover reseals itself while a low positive pressure still exists within the transformer. This definitely prevents breathing. Moisture *cannot* enter the transformer before, during or after the valve has functioned.

Dramatic proof of resealing effectiveness has been obtained from operating tests conducted with the relief device fully submerged in liquid. The inside of the valve remained *free of moisture.*

FULLY TESTED FOR DURABILITY, EFFECTS OF HEAT AND COLD

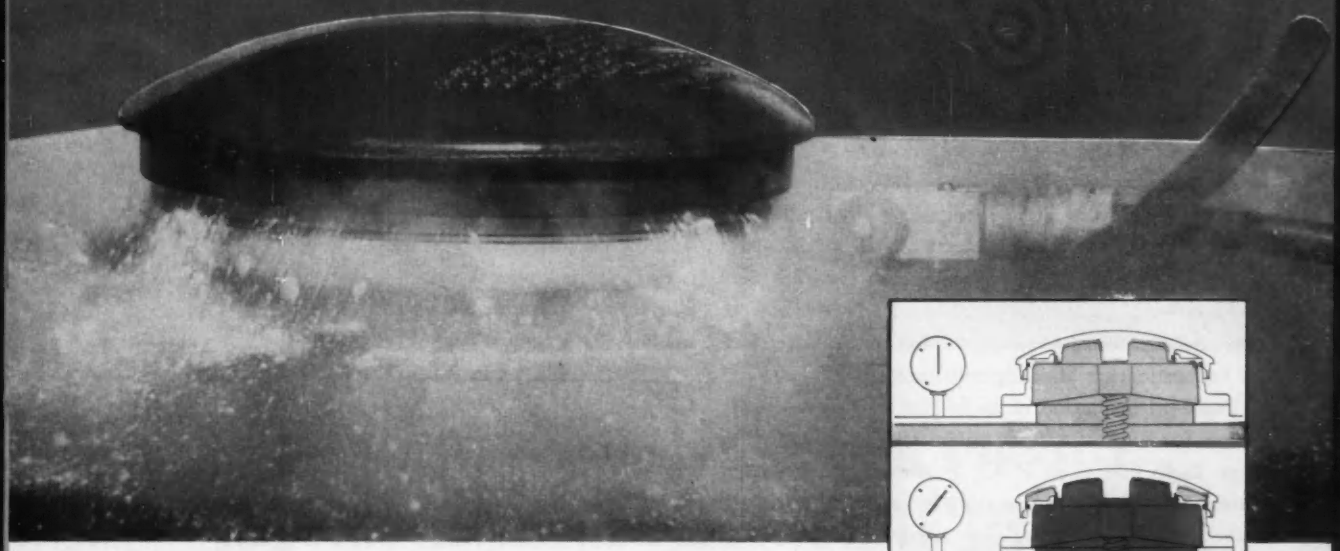
In addition to immersion tests, Pennsylvania's new pressure-relief device has undergone tests for conditions that far exceed any that are likely to be encountered in actual service. These include life tests of as many as *12,000 operations* with standard production

PENNSYLVANIA TRANSFORMER

PENNSYLVANIA

on all Pennsylvania Power Transformers

The pressure-relief device is shown in the closed position (right) and while operating (below). The upward movement of the cover causes the optional signal arm to pivot to an upright position.



models of the valve.

During life tests, the pressure-relief devices were intermittently operated at temperatures as high as 100°C., and also at −15°C. with a heavy formation of ice on the cover. To test the effect of hot oil, valves were immersed in 100°C. oil, with gaskets fully exposed, for as long as 96 hours.

VALVE OPERATES WITHIN ±½ POUND OF PREDETERMINED SETTING

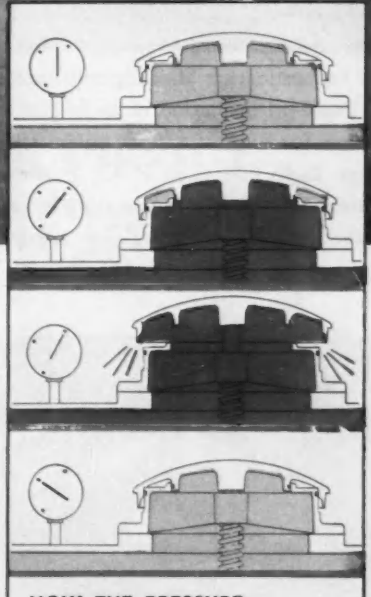
At no time during the foregoing tests did the valves fail to operate within ±10% of the original setting. Following the tests, *all* relief devices were found to be pressure tight.

Pressure-relief devices supplied on Pennsylvania Power Transformers operate within the even closer tolerance of ±½ pound of the predetermined setting. This is assured by standard pretesting of production models. To further safeguard the transformer, the device relieves internal pressure within a split second after the predetermined setting is reached—as shown in the accompanying high-speed camera shots.

OPTIONAL ALARM AND SIGNAL ARM CAN BE RESET FROM GROUND LEVEL

Pennsylvania Transformer's new pressure-relief device is supplied with a combination alarm and signal arm, if requested. The signal arm, which is painted red, is easily seen from ground level when in an upright position. Resetting the signal arm—which can be done from ground level with a hot stick—also resets the alarm.

The new maintenance-free pretested pressure-relief device is available on all Pennsylvania Power Transformers with or without the combination alarm and signal arm. Contact Power Sales Department, Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.



HOW THE PRESSURE-RELIEF DEVICE OPERATES

When the predetermined pressure at which the device is set to operate is exceeded, the spring force acting on the cover is overcome and the pressure, initially confined to the small "primary" area of the relief cover, escapes to the larger "secondary" area. This immediately multiplies the force acting on the cover and lifts it to its full open position, thus allowing the pressure to escape to the atmosphere. The spring force then resets and reseals the device while an internal pressure of approximately five pounds still exists within the transformer.

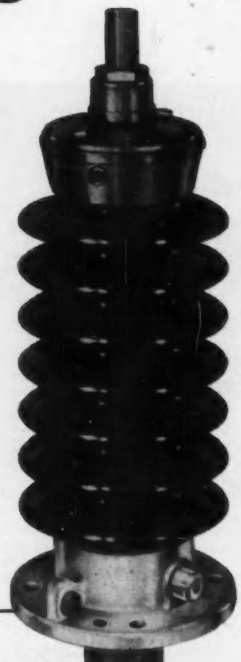
POWER TRANSFORMERS

LAYER-AFTER-LAYER

OF RELIABILITY GOES INTO

LAPP POC* BUSHINGS

FOR YOUR SYSTEM



Lapp POC* Bushings conform to ASA Standards. The small diameters specified by these standards permit design of new transformers and circuit-breakers of lighter weight, smaller size . . . and by use of inexpensive adapters, provide broad interchangeability for replacement in old equipment.

Lapp's solution to this reduced-diameter requirement is the POC* Bushing. In this design, a condenser series distributes voltage stress evenly and safely throughout the insulation. The condenser core is wound, as shown below, of multiple concentric layers of high-dielectric paper, interleafed with spaced aluminum foil layers. Paper is high-vacuum-impregnated and surrounded with oil, and the entire paper-oil core totally enclosed; the porcelain shank will not track or deteriorate under leakage current caused by contamination of equipment tank oil.

Paper-oil insulation ranks first in reliability as insulation for highest voltage cables, potheads and bushings. Lapp uses it in POC* Bushings at all voltages from 15kv up. Won't you sleep better with their extra safety margin protecting *your* system?

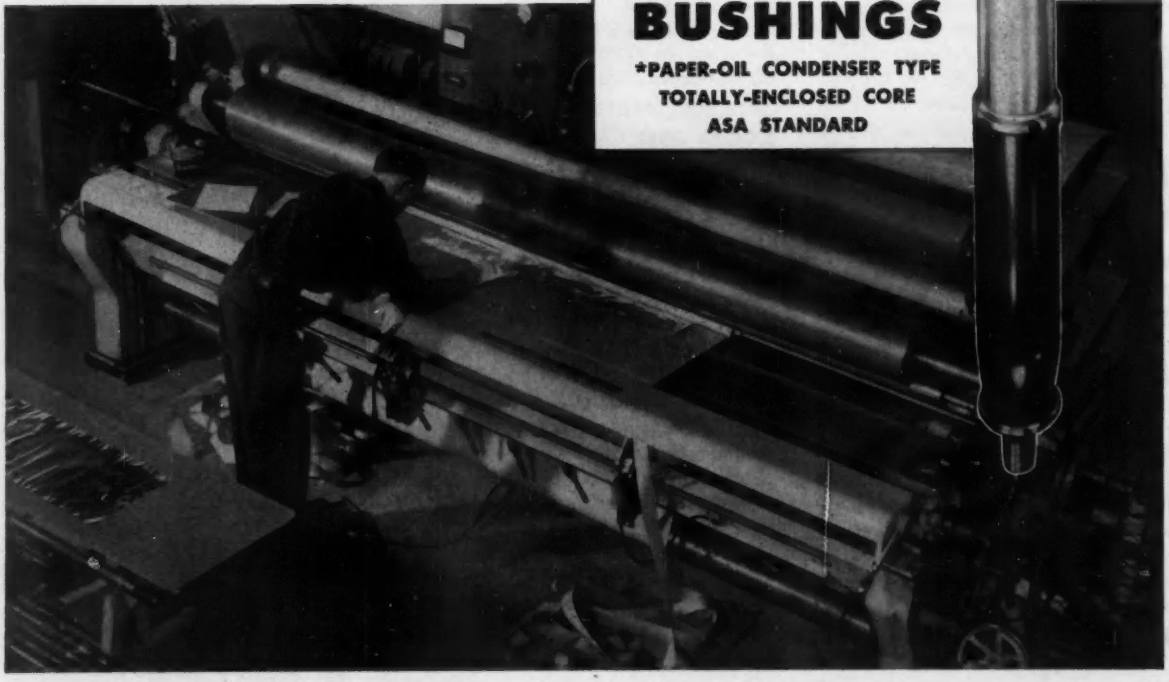
Lapp Insulator Co., Inc., LeRoy, N. Y.

Lapp

POC*

BUSHINGS

***PAPER-OIL CONDENSER TYPE**
TOTALLY-ENCLOSED CORE
ASA STANDARD



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ELECTRICAL METALLIC TUBING

Push a button—flip a switch! Satisfied customers with ample-sized electrical conduits command all the conveniences, comforts, and services, power producing utilities can deliver—today and tomorrow.

In offices, factories, commercial buildings, institutions, Republic's ELECTRUNITE® E.M.T. provides economies that allow adequate size raceways to be installed *now* . . . plus economies that make it possible to include additional electrical conveniences *in the future.* These economies may be applied to the purchase of additional load-building equipment at no extra cost. Further proof that . . . the *best* costs *less* installed.

Republic's ELECTRUNITE E.M.T. original installation features offer many economies, too. "INCH-MARKED"® in feet and inches for easy, accurate measuring. Full length "GUIDE-LINE" helps keep bends in the correct plane, avoids costly "wows", wasted time and material.

Exclusive "INSIDE-KNURLING" provides a ball-bearing like surface that reduces wire-pulling as much as 30%. Greater load-building capacity can be added quickly and easily.

And Republic ELECTRUNITE E.M.T. is produced to A.S.A. Specification C80.3 and Federal Specification WW-T-806, latest revisions and carries the Underwriters' Laboratories Seal of Inspection. ELECTRUNITE E.M.T. also offers complete wire protection in accordance with the National Electrical Code.

Investigate the economies of ELECTRUNITE E.M.T. See why more and more utilities are using it and suggesting to their customers that it is the practical way to eliminate difficult, costly electrical conduit installations and to "provide for the future". Call your Republic representative, or write direct today!

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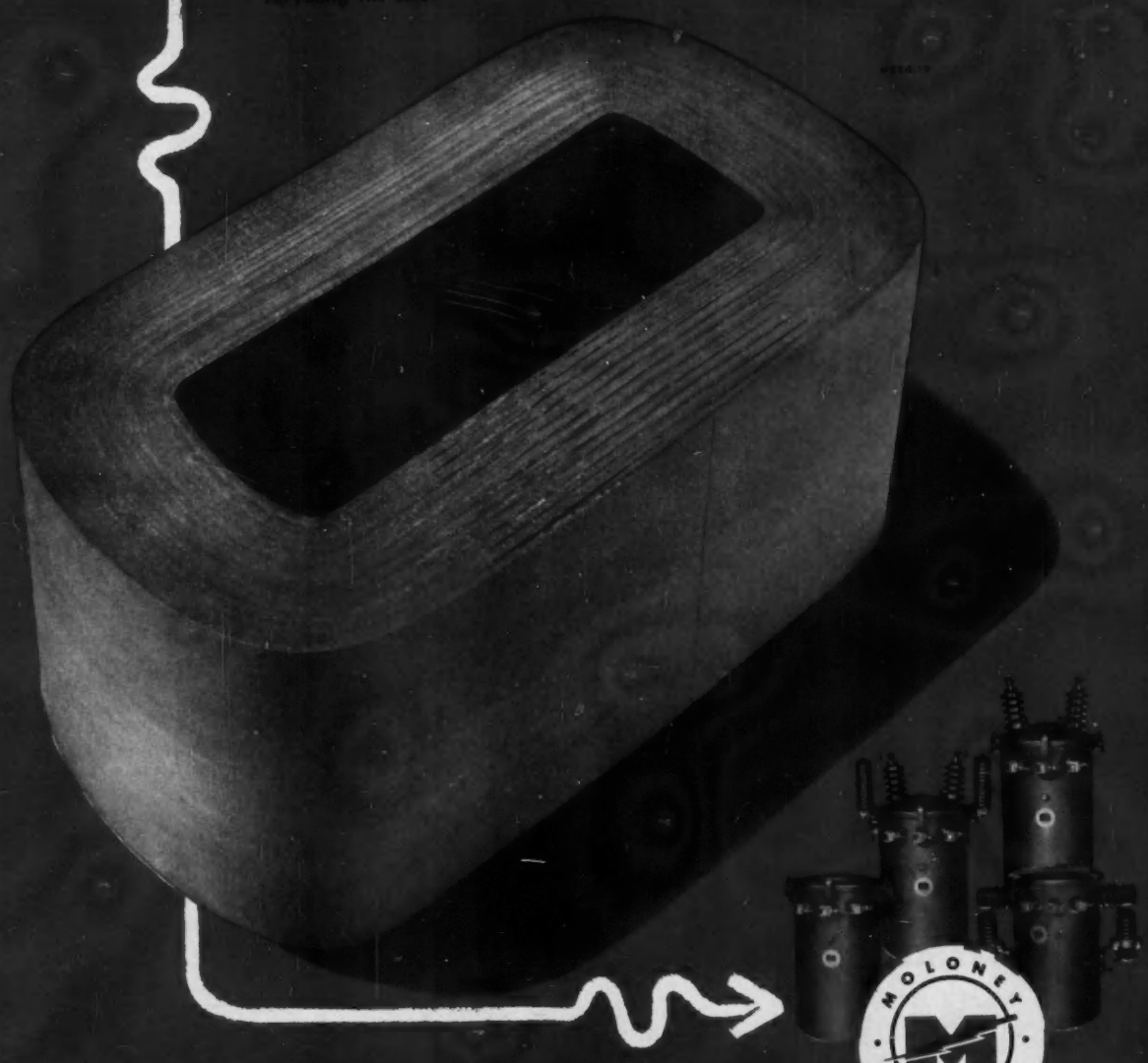
The new Moloney Distribution Transformers incorporate an entirely new core. A low reluctance path for the magnetic lines of force is provided in this core by bridging the cuts in the laminations. This improved magnetic circuit results in substantially lower exciting current.

This new core permits improvements in the design of other components which leads to a completely new distribution transformer, features of which are . . . lower exciting current . . . lower losses . . . lower impedance . . . improved regulation and reduced weight.

The complete line of transformers, ranging in size from 3 to 167 KVA, in both conventional and CSP types, is now in production.

These new Moloney Distribution Transformers are the result of Moloney's continuous research and development programs . . . Specify Moloney . . . All Along The Line.



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Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 30, MO. AND TORONTO, ONT., CANADA

Editorial Comment

AUGUST 11, 1958

Innovation is a Confounded Nuisance

We were very much impressed with an editorial that appeared in the July 19 *General Electric Review* entitled "Innovations: Nuisance and Necessity." In this editorial C. Guy Suits made the apt statement that innovation may be a confounded nuisance but that business obsolescence may be a disease.

We hear quite regularly that a large percentage of the electric system has been installed in the past ten years and that, therefore, there can be no real obsolescence here. Undoubtedly this is substantially true, at least with regard to the generating system. But obsolescence does exist and to a sufficient extent to deserve careful consideration. Obsolescence need not be related to age of equipment. It can also be in the areas of design and operation.

We believe that more attention should be given to seeking out the areas of obsolescence and less said about that part of the system which can well be termed as modern.

The Source of Capital Funds

Utility presidents have for some time been pointing out that the raising of capital was their number one problem. Fortunately the basic economic health of the industry has permitted utilities to compile a fine record in the area of raising capital funds. Why, then, do the presidents continue to rate this as their number one problem and why do many say that it will continue to be in this category in the years ahead?

We have recently been attempting to make an investigation of the market for utility securities over the past few years in order to identify the sources of capital and the changes that are taking place. So far we have not found a satisfactory statistical record which could be used as a basis for analyzing future financing problems.

We are quite optimistic regarding the continued ability of electric utilities to raise funds for the tremendous expansion which is ahead. We do not believe, however, that anyone can conclude that the buyers of utility securities will necessarily be available in the future to the extent they have in the past. At least it would seem foolish for an industry which depends upon external financial sources to the extent that this one does to go forward without a better understanding of the problems which may arise.

We believe that it is highly important for some industry committee to make a thorough study of the problems which may arise in the future. This study should include the potential sources of funds, the potential competitors for these funds, the relative availability of funds, and the steps that should be taken to assure the industry of its requirements. The internal generation of funds from the treatment of accelerated depreciation has had a great impact on this whole area. This device itself may have its limitations and of course, there are many companies that have not taken advantage of this device. We would, therefore, like to see a penetrating study of this whole problem as a basis for industry planning for the future.

TVA Financing Bill Pigeonholed in Last Lap of House Action

Last-minute efforts of Tennessee Valley Authority backers to push a bond financing program (the Kerr bill) through the House were virtually squelched last week. The bond measure, already approved by the Senate and the House Public Works Committee, was shunted aside in a close vote by the powerful House Rules Committee.

The Rules Committee has the say on what legislation gets preferential clearance for House consideration. Sometimes legislation is taken up without the committee's approval, but not often. That slim chance may be seized by TVA supporters in the session's closing days to get the plan its day in court, but prospects of success are small.

Until last Wednesday, Capitol observers felt that, after years of controversy, some kind of bond program would be voted. Now, that is changed, although the outcome will not be final until the last days of the session. Whatever happens, the issue is certain to be revived next January.

By a nearly party-line vote, 19-14, the Kerr bill was approved by the House Public Works Committee, after lengthy debate and after some 30 witnesses testified against it.

Even if Democrats put the bill across, there is doubt whether President Eisenhower would sign the bill as it now is written. The White House has been on record for four years in favor of TVA bond financing but with tight congressional and budgetary controls. Administration officials feel the President may not take the Kerr bill's mild limitations.

As a matter of fact, some officials take a dim if not flatly opposition view toward any kind of bond financing legislation.

A spokesman for the General Accounting Office told the committee: "It is basically undesirable . . . to authorize the TVA to issue its own bond obligations to the public." He added that even if bonds were sold to finance TVA construction, the Treasury Department should sell them. Also the Budget Bureau and Treasury witnesses all testified that provisions of the Kerr bill fall short of limitations requested by the President.

Critics of the bill claim that the measure, if enacted, would signal the "beginning of the end" for private electric utilities all over the country. Their fear: The TVA measure would improve chances of passage of similar measures to expand other regional federal power authorities. One plan is to set up a Columbia River development corporation. Sen Richard Neuberger (D-Ore.) hopes to get such legislation next year to replace the Bonneville Power Administration, now under the Secretary of Interior.

SPORN: "More than 30% . . ."

In his testimony Philip Sporn, president, American Electric Power Co, warned, "S. 1869 would greatly extend the already autonomous character of TVA." He called for a specific definition of the area which TVA may serve, if a bond plan is adopted. Without it, the way could be open for a "more than 30% expansion of TVA's existing service area."

The Kerr bill falls considerably short of the restrictions called for by the Comptroller General, the Budget Bureau and the U. S. Treasury, but it does have a number of controls not included in the Jones-Davis bill, which was approved by the House Public Works Committee in 1957. That bill was shelved and the Kerr bill substituted.

The Kerr bill contains the following major provisions:

1. A $750-million limit on the amount of bonds that TVA may have outstanding at any one time.

2. TVA may use the bonds for power deliveries into:

- An expanded service area of about 25,000 square miles.
- The rest of any counties now partially served.
- The rest of any areas lying within the Tennessee River basin.
- To co-ops being served by TVA on July 1, 1957.

3. TVA would be given "utility responsibliity" for the first time in its present service areas, including exclusive rights to the area.

4. No congressional approval would be needed for TVA to issue bonds, although the Secretary of the Treasury must be notified, and he could delay issuance up to 90 days. TVA may build new power projects after a 90-day period following notification of Congress and the White House.

5. Repayment to the Treasury of TVA's appropriated indebtedness —now based on a 40-year basis— would be extended to 120 years.

Opponents of the Kerr bill in the House committee listed their absolute minimum restrictions on a bill, before they would accept it:

1. Require TVA to repay its appropriated debt to the Treasury in a "reasonable" (probably 40-year) period.

2. Keep TVA within the framework of the Government Corporation Control Act and the Budget and Accounting Act. These laws give the Treasury authority to approve the amount, interest rate, and method of issuing bonds.

3. Prevent bypassing of congressional appropriation committees. The Kerr bill does not require a review by these or any other congressional committees into TVA's financial status, and there is only an implied check by Congress that TVA must stay within its $750-million debt limit.

4. Place a "realistic limitation" on the amount of bonds to be issued, and on the manner of issuance (a $225-million total debt has been suggested by the White House).

5. Limit TVA to its present service area.

6. "Insure adequate annual review" of TVA activities by Congress.

Comptroller General Tilts REA Cart

His ruling on a three-year-old co-op loan could jeopardize legality of past REA loans, block G&T projects, and provide power companies a 'preference' status on serving customers. Crux of the upheaval is definition of 'area' and 'persons'

A little-known but powerful agent of Congress has handed down a potentially far-reaching finding that may prohibit use of federal loans to make rural electric co-ops competitive with private power.

The General Accounting Office holds that the Rural Electrification Administration lacks power to make loans to co-ops for the purpose of providing electric service to areas where private power firms operate —if the private utilities are willing to provide adequate central-station service to new customers.

As most Washington experts read it last week, the finding could:

- Jeopardize the legality of many REA loans, since the edict apparently requires a direct turnabout in administrative interpretation of the REA act.
- Block most REA loans for expansion of generation and transmission facilities.
- Bar co-ops from serving any customer that a private utility says it's willing to serve.

The man behind this ruling—which is now in the process of being contested by the Dept of Agriculture and the National Rural Electric Cooperative Assn, among others—is the Comptroller General of the U. S., Joseph Campbell. As the top man in the General Accounting Office, he is Congress' watchdog over expenditure of federal monies.

Ruling Lacks Statutory Authority

Campbell has no statutory authority to enforce his findings. His only "punitive" power is to report to Congress that a department or bureau is, in his opinion, either violating the letter or spirit of a law. Nevertheless, officials in the Eisenhower Administration have generally contributed to the rising prestige of the Comptroller General's position by acquiescing to his wishes on most major issues.

A spokesman for REA says only that "The REA and the Dept of Agriculture disagree with the decision and are requesting immediate reconsideration (by Campbell)." The implication is that, unless Campbell changes his mind, REA and its parent agency (the Agriculture Dept) will acquiesce.

A spokesman for NRECA, which is preparing a formal brief asking Campbell to reverse himself, says the ruling—if followed by REA and literally enforced—might conceivably require the REA administrator to re-examine every outstanding loan and to recover much of the money. (Informed sources say Campbell has no such intention, but would apply the rule only to current or future cases.) Another source says, "This thing could put the cooperatives almost literally out of business, but I can't conceive of it standing. If Campbell doesn't reverse himself, surely Congress will take some action."

Battle of Briefs Looms

NRECA has retained Attorney Bill Wise, a former REA deputy administrator, to prepare its brief. The REA-Agriculture Dept brief is being drawn up in the office of the department's general counsel.

Directly at issue is $120,000 of an $11.1-million REA loan—made three years ago, Sept. 9, 1955—for the Central Iowa Power Cooperative (CIPCO).

Campbell has instructed Agriculture Secretary Ezra T. Benson, the ultimate overseer of REA, to recover the $120,000—the sum attributable to 20 mi of line which a CIPCO member, the Greene County Rural Electrification Co-op, installed to serve power needs of a new plant built by the Lehigh Iowa Sewer Pipe & Tile Co.

Those seeking to overturn the decision have zeroed in on one paragraph in particular, wherein the Comptroller General wrote:

"It is clear . . . the purpose of the central station service limitation (as written into the REA Act by Congress in 1955) was to exclude loans for the paralleling of existing systems or creating competition with existing facilities by prohibiting the use of loan funds for construction of transmission lines and substations to furnish power to an area already served by private power companies when such companies are willing to provide adequate central-station service to persons within the area who are not tied to the power lines."

Act Has One Limitation: NRECA

An NRECA spokesman says the group's brief, asking Campbell to reverse himself, will argue that there is only one limitation in the act—that co-ops cannot serve persons already receiving central-station service, "in other words, the co-ops can't go raiding."

Therefore, the key words in the quoted paragraph, in the view of co-op spokesmen, are "to an area." One of them says, "If the act had been written so as to apply to areas —rather than persons—there never would have been a cooperative. For even back in 1935, power companies were in existence in practically all 'areas'."

This, then, is the central issue in the case. That Campbell knowingly put a new rein on the loan powers of the REA administrator and the Agriculture Secretary, may be inferred from another paragraph of his opinion, which says:

"It may be that literally accepted the terminology . . . (of the act) is sufficiently broad to authorize a loan for the purpose of furnishing central station electric service to a person not receiving such service, even though the service is available to such person and that the effect of the loan will be to create competition with an existing private utility. However, in construing or considering the application of a statute it is permissible to look at its evident spirit when this is necessary to give

(*Continued on page* 38)

Salesmen tote quick-recovery mockups off to a promotion, as . . .

Detroit Ed Mounts Water Heater Drive

Detroit Edison Co is now mounting an intensive electric water heater sales campaign that it hopes will put an additional 100,000 units on its lines by 1962.

The 100,000 quick-recovery water heaters will represent a boost in saturation from 11 to 18%, and will mean spending almost $350,000 on promotion. Quota for 1958 is 18,000 units.

Part of Over-all Drive

Actually, the water heater push is part of an over-all promotion program that will include electric house heating, Reddy Wired Homes, and the Bronze and Gold Medallion Homes. The real objective of this intensive, long-range sales drive is, according to Detroit Edison Sales Vp E. O. George: "to improve kilowatt-hour sales and annual net revenue from residential and rural business through the promotion and sale of major appliances with favorable load characteristics." DE's thinking points toward getting water heater saturation to approach approximately half that of electric ranges, which at the end of 1957 was 40%.

The big utility is going after the quick-recovery water heater load in several ways:

- Sometime ago when conducting a "competitive saturation" survey DE found that one reason for the lack of electric water heater acceptance was the inadequacy of the charging period. Accordingly, a 20-hr charging period that is said to give the customer 24-hr service was instituted. Energy is sold at a monthly flat rate. But customers can use only certain size heaters to get the rate. The DE sizes and rates: Bottom and top elements in a 50-gal tank are 2,500 w and 4,500 w, respectively ($3.88); in the 80-gal tank size, they are 3,500 w and 4,500 w ($5.34); for the 110-gal tank size they are 4,500 w both top and bottom ($6.79).

- Advertising is intense, and embodies several departures from regular Detroit Ed copy practices. For one thing, it is repetitive almost to the point of monotony: " . . . shower after shower . . . wash after wash after wash . . . pail after pail after pail . . . tub after tub after tub . . ." All of this pounds away a theme of "plenty of hotter hot water." Another departure from the DE norm: product and price advertising. In the past, straight DE ads carried no product or price, on the grounds that for the utility it was impracticable. In this campaign, however, DE is spending cooperative advertising dollars with dealers and manufacturers, with whom product and price are "musts." Media being used include newspapers (with editorial support), radio and TV.

- Dealers are getting special wooing. Items: Dealer and plumber in-store promotion, including sales incentives and such devices as laundry demonstrations using the electric water heater. Sales training and program presentations are given to dealers and their help. DE is also sharing the cost of permanently plumbed water heaters on dealers' floors which are used for demonstrations.

- The Detroit Edison sales force is being increased. The six-man DE sales crew serving metropolitan Detroit has been upped to nine, and plans eventually call for 18. Salesmen track down leads supplied by meter readers, customer service people, etc. Their sales average to

date is 1½ water heaters per man per day. The lead system seems to be working well. A recent check showed 2,200 leads turned up 631 sales, an average of almost 33%. One particularly productive lead source has been an LP gas water heater survey run by the meter readers. LP gas customers are especially susceptible to the electric water heater story, DE found. The electric water heater costs less to operate, there are no worries about running out of fuel, and its modern features are big plus items in the sales story.

• DE is also educating other employees through a series of meetings at which the need for revenue and load are clearly documented. Response is reported good.

Results to Date

What have been the results of the water heater campaign? Sales for the first seven months of 1958 totaled 6,615. Of these, 3,253 were sold by dealers and plumbers, and 3,362 were sold by Edison.

But if electric water heaters are the high point in present DE promotion, they are not the only thing being pushed. The utility recently set up three sets of standards for electrical content in homes: Reddy Wired Homes, Reddy Wired Medallion Homes, and Gold Medallion Homes. All require an electric water heater installed. The Reddy Wired homes require, in addition, 100-amp service, and 220-v wiring for a range and clothes dryer. Reddy Wired Medallion homes have these requirements, except that a range must be installed; then add a dishwasher, garbage disposer or appliance center, and work-center lighting. The "Cadillac", of course, is the Gold Medallion Home: All of the above requirements with a clothes washer and dryer installed, disposer and appliance center, certified wiring, "Light for Living" standards, and electric house heating—resistance or heat pump.

Expect $344,500 More EAR

Quotas for the three types of homes for 1958 are 2,000, 1,000 and 100, respectively. If quotas are met, the gross EAR from each class of home is expected to be $198,000, $107,750, and $38,775, respectively. Total 1958 budget for the job is put at $230,000.

Answers are in '$' at Commonwealth Ed when . . .

Engineers Tackle Economics

"Interest rate" is as important as "heat rate" to some engineers in training at Commonwealth Edison. The company is teaching them engineering economics.

The decision to replace an old generating unit with a new one requires knowledge of depreciation, rate of return, taxes, and insurance, as well as engineering know-how, the company feels. And there are many other engineering problems that depend partially on economics for a sound solution.

That's why Commonwealth Ed set up last year a pilot course in engineering economics which established principles and techniques for handling the problems of plant additions, replacements, and relocations, and drummed up wide interest in the course throughout the engineering organization.

Success of the course is seen in today's "alumni" of 59 men. Four classes will be held this fall.

The 32-hour pilot course consisted of 11 meetings, held once a week under the tutelage of Prof Daniel F. Hang of the University of Illinois.

Seventeen of the 19 members of the class came from the engineering and operating divisions. The majority were department heads or assistant department heads.

Members of the class learned the objectives of the course at a luncheon meeting attended by financial and engineering executives. Certificates from the University of Illinois were awarded at another luncheon meeting held at the end of the course.

First step in the course was a review of fundamentals: time-cost of money, rate of return, depreciation, federal income tax, operating and maintenance costs, and insurance. Company experts, including G. R. Corey, financial vp, tied the fundamentals to actual Commonwealth Edison operations. Special techniques of present valuing were analyzed by John Brownlee, of the company. These were compared to the year-by-year analysis, using book accounting methods.

Highlights of the course were the use of graphical analysis of time-cost of money, the development of short-cut carrying charge and present value tables based on Commonwealth Edison's capitalization structure and required rate of return; and the practical application of these techniques on specific problems.

Each member of the class submitted typical engineering problems from his own area. Then these problems were assigned as home work. The approved solutions were discussed at the next meeting.

Material presented in the class, together with problems submitted, are being incorporated in a manual, to be used as a text in company courses in engineering economics.

Tilts REA Cart

(*Continued from page* 35)

effect to the intent of Congress."

Sen Hubert Humphrey (D-Minn.) has denounced Campbell's decision in a Senate speech. "The ruling is made in connection with a single case," Humphrey asserted, "but the language is so broad that it would write policy for all future time unless it is reversed."

Campbell's decision does not specify it, but informed sources say the case was brought to his attention by Iowa-Illinois Gas & Electric Co, a private utility which sought to serve Lehigh's new pipe plant and was rebuffed in favor of the Greene County co-op.

The geographic location of the new plant—on the same tract, but 160 ft removed from an existing pipe plant operated by the same firm—has raised a collateral issue. The pipe company, the Greene County Co-op, the parent co-op (CIPCO) and, finally, REA, all determined that the new plant was a "separate person" from the existing plant and, therefore, was not receiving central station electric service.

Lehigh's older plant has been and still is receiving 25-cycle service from private lines—first owned by a traction company and, later, by Iowa-Illinois, which bought out the traction company. When Lehigh decided on equipment for its new plant that would require 60-cycle service, Campbell's decision noted, Iowa-Illinois offered to supply the power.

Lehigh declined the offer on grounds that the co-op rates were lower. Subsequently, there followed the chain of findings that the new Lehigh plant was a separate person from the old one and, therefore, was entitled to co-op-supplied power.

Campbell questions this, but this disturbs the cooperative movement's spokesmen much less than the broader questions raised by his opinion. It seems likely that NRECA's brief will touch only slightly on the question of a separate person, leaving that point to be covered in subsidiary briefs to be filed by the CIPCO and Greene County co-ops, and presumably by REA and the Lehigh firm.

Atomic Progress

• Cold war potential

• President Eisenhower last week threw a monkey wrench into congressional plans for pushing the Administration into building atomic power reactors it doesn't want. The result may portend a renewal of the cold war between Democrats and the Executive branch.

The President signed the 1959 authorization bill for the Atomic Energy Commission. But his accompanying statement raised considerable doubt that his Budget Bureau will ever release money for actual consideration of some "objectionable" projects. Items:

1. Mr. Eisenhower said he considers it "unsound to proceed with construction of a $145-million plutonium production reactor capable of being converted to electrical generation, unless a current Defense Dept review reveals a real need."

A majority of the AEC commissioners is known to agree with the Joint Committee on Atomic Energy that the plutonium producer is needed, but the President noted the Defense Dept "is the executive agency to which I look for dependable estimates of these requirements." Also, Mr. Eisenhower sees no justification for the extra $25-million needed to convert the project.

2. The President takes exception to the attempt to legislate "administrative and technical procedures" —namely, the new rules governing the cooperative power demonstration projects. He says discouragement of private proposals "impedes rather than accelerates the achievement of economic atomic power."

3. As an example of such limitations, he cites the provision subjecting industry and AEC to "unduly restrictive (three month) time limits" in negotiations for cooperative construction of the $51-million gas-cooled power reactor.

4. He objects to the provision for construction of $39-million in research facilities beyond the administration's request, and the provision for design studies of four power reactors.

Capital Hill reaction was quick —and angry.

Democrats threatened to withhold approval of the Euratom agreement —considered a must by the Administration.

All this underscores the Democratic suspicion that ex-AEC chairman Lewis Strauss is still calling atomic signals at the White House.

U. S. Power Picture

• Nashville agrees to double its tax equivalent payments

• Grand jury to investigate Grant County PUD

• Over recent years Nashville Electric Service's payments in lieu of taxes have held steady at about $600,000 a year. Last week the system's power board agreed to double this amount to meet the city tax assessor's determination for a tax equivalent of $1,256,653.

The increased payment to the city could be done, the board said, because of the recent retirement of the original $15-million bonded indebtedness borrowed for the purchase in 1939 of Nashville properties of the former Tennessee Electric Power Co.

The remaining bonded indebtedness of the system now stands at $22,860,000 on the plant value of $54,736,962.

According to the NES report to the board, the $1,256,653 payment in lieu of taxes would compare percentage-wise with this year's total operating revenue of $19,708,-232.

Leon Gilbert, power board chairman, said the change was in complete accord with the contract with Tennessee Valley Authority. The only statement TVA has made is that it was studying the contract.

There have been no expressions from officials of other municipalities on whether they will seek to follow Nashville's lead and ask their power boards to increase tax equivalent payments.

• Papers are being drawn up to

convene a grand jury at the "earliest possible moment" on orders of Superior Court Judge B. J. McLean to investigate the business operations of Grant County (Wash.) Public Utility District.

The judge's order came July 29 and was the latest move in a two-week controversy over the PUD's affairs. PUD commissioners on July 28 accepted the resignation of Glenn Smothers as the district's manager. Three days earlier the firm of Washington and Wickwire was fired as counsel for the PUD.

The utility is building the $166-million Priest Rapids dam on the Columbia River and it plans to start work next year on Wanapum dam, a $200-million project upstream from Priest Rapids.

Judge McLean's action came after requests for a grand jury probe made by church councils at Ephrata, Soap Lake and Quincy, Wash. Requests also came from former PUD lawyer Nat Washington, the county's prosecutor, and one Grange unit.

Several irregularities have been alleged in the conduct of PUD business, including such things as the failure to call for bids on outlays of more than $5,000.

At a hearing before the judge on July 31, Attorney Washington read a letter from a materials supplier for the Priest Rapids dam which mentioned a "five-per-center" deal. The supplier contended he had been approached by an unnamed Ephrata businessman, who gave assurances that he could obtain the business for a 5% commission.

State Auditor Cliff Yelle recently assigned two state examiners to look into the PUD's books.

Foreign

• Big yield in B. C.

• Announcement of the first project of the multi-million dollar Wenner-Gren hydro-metallurgical development in British Columbia's Rocky Mountain Trench will be made at the end of September. This was revealed in Victoria following the visit of Dr Axel Wenner-Gren who met with Premier Bennett and members of the Canadian government.

Speculation was that the initial undertaking might be a monorail or railway into the Trench, or the first phase of the 3,000-Mw hydro project.

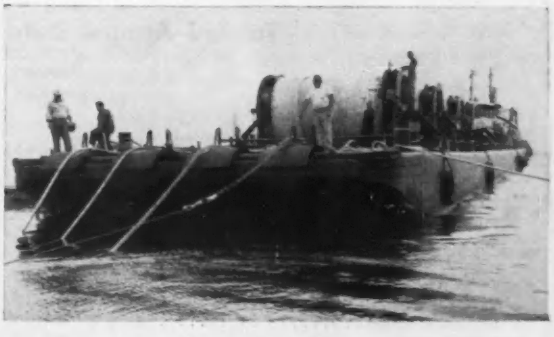
The objective of the Wenner-Gren B. C. Development Co is a huge, integrated industrial area. It would include the world's largest single hydro installation, the monorail or railway, mines, pulp and paper mills, and associated industries.

Wenner-Gren, a Swedish industrialist, was emphatic that financing of the project presented no problems; "so many people from Europe and other parts of the world want to invest in it." He said that engineering studies in the area have yielded "even more than we expected."

Prior to Wenner-Gren's visit, C. W. Nash, director of load development for the B. C. Power Commission, predicted use of electricity in the province will grow nearly 25 times in the next 50 years, from present load of 2,100 Mw to 47,900 Mw. He called for coordinated planning for future development of the province's energy resources in a Hope, B. C. meeting. A power grid with voltages up to 500 kv would be required, he said, for future operation of an integrated system.

AUSTRIA: Prices for power—Europe's lowest up to July 1—have been raised. The increases average 12% for municipal and provincial companies, and 25.5% for the Austrian state-owned grid. The higher rates will help cover the cost of capacity expansions calling for $608 million during 1958 through 1963.

RUSSIA: Designs have been completed on the primary task of harnessing the rivers in the Amur basin, covering about 700,000 sq mi, the Soviet News reports. Russia hopes to build 70 hydro power stations in the area, which is rich in iron ore and coal deposits.



Lake Champlain Crossing Links St. Lawrence to Vermont

A submarine cable that will carry 115 kv under a 7,800 ft length of Lake Champlain was laid July 23 between Cumberland Head, N. Y., and Gordon's Landing at Grand Isle, Vt. The four cables will carry energy transmitted from the St Lawrence Power Project via Plattsburgh, N. Y. At left, workmen strip off armor on each phase from water line to land terminal to prevent overheating. Above, the laying begins.

Three Texas Companies Study

Year-long test program develops data on characteristics of freezer, dishwasher, TV, dryer and washer loads

Three Texas companies are nearing completion of what is probably the most comprehensive appliance load characteristics survey any segment of the industry has undertaken. The companies, Dallas Power & Light, Texas Power & Light, and Texas Electric Service are subsidiaries of Texas Utilities Co. Objectives of the survey are:

1. To determine the saturation of various appliances.

2. To determine the diversity inherent in various appliance loads.

3. To gather data that will designate the appliances and areas in which sales efforts can be most effective.

4. To evaluate the effects of appliance sales.

5. To provide data that will facilitate the most economical distribution system designs.

6. To improve service to customers.

Equipment for testing appliances was a watthour meter and a seven-day graphic demand meter. Charts were of the outside-zero type with 15-min-interval, integrated demands. Each 15-min interval on the demand meter charts was read and recorded, and the readings were transcribed to punch cards. Average clock hour demands were calculated and punched in the cards. Results shown in the accompanying tables and charts were taken from these summaries.

Fifteen typical residential areas were surveyed. These were lateral feeder areas selected for their loads and the number of homes. The feeders had load characteristics similar to those of the overall residential load of the combined systems.

Two Surveys Made

Actually two surveys were conducted. The first served as a trial run, pointing up the information needed and what had to be done to obtain it. The second compiled and analyzed data based on tests on:

60 ranges
32 central furnace fans
41 bathroom heaters
7 radiant panel heaters
29 water heaters
15 dishwashers
30 food freezers
77 automatic clothes washers
39 automatic clothes dryers
231 entire homes
15 entire feeder areas

Besides these tests, 159 meters were set for studying various devices for comfort cooling.

Data from the survey have been compiled and correlated for five appliances: Home freezers; dishwashers with heating elements; television; automatic clothes dryers; and, automatic clothes washers. Data on television were obtained from tests by a Dallas television station.

The test on each appliance was for 12 months, on different appliances at various times. Composite figures for each group of freezers, dishwashers, clothes washers, and clothes dryers were used, except for maximum non-coincident demands. A composite Tuesday, for example, is an average of the test results for all Tuesdays. Kwhrs were derived from all data available.

Significant annual data for the five appliances, correlated to date, are shown in Table I. For television, only load shapes for summer and winter are available. Therefore, demands and kwhr in Table I are based on load shapes and average television-set rating of 200 w.

In the tabulation on coincidence

Table I–Annual Data for Appliances per Unit

	Home Freezers	Dishwashers with Heating Elements	TV Sets	Clothes Dryers	Clothes Washers
Clock Hr Demand in W					
Max non-coincident	298	829	200	3,478	288
Group peak	231	150	132	745	72
At time of residential peak	178	92	106	149	8
At time of system peak	203	72	37	184	12
Kwhr	1,034	274	360	1,166	89
Coincidence Factors					
At group peak	68.1%	18.1%	66.0%	21.4%	25.0%
At residentjal peak	59.7%	11.1%	53.0%	4.3%	2.8%
At system peak	68.1%	8.7%	18.5%	5.3%	4.2%
Load Factors Based On:					
Max. non-coincident demand	39.6%	3.8%	20.5%	3.8%	3.5%
Demand at group peak	58.1%	20.9%	31.1%	17.9%	14.1%
Demand at residential peak	66.3%	34.0%	38.8%	89.3%	127.0%*
Demand at system peak	58.1%	43.4%	111.1%*	72.3%	84.7%

* Load factors over 100% indicate that the diversified demand at time indicated is less than the average demand for the year.

Characteristics of 5 Appliance Loads

factors, it will be noted that for home freezers 68.1% and for TV sets 66% of the total demand possible appear on the individual appliance group peaks. For dishwashers the figure is only 18.1%, approximately a quarter as much as for the other two appliances. For clothes dryers, it is only 21.4%, and for washers only 25%.

Load factors of each appliance, based on demand at the time of the residential and system peaks, are higher than the overall residential load factor which is about 30%.

Loads, Peaks Correlated

Monthly kwhr variations for freezers and dishwashers are in Fig 1, and for washers and dryers in Fig 2. Energy use for dishwashers is fairly uniform throughout the year, but home freezers have a seasonal swing, reflecting the temperature effect on this load. Clothes washers have a fairly uniform use throughout the year. The curve for dryers indicates that in warm weather some customers dry clothes in the sun. Each appliance curve on the two charts can be compared to the system and residential sales which come to peak in the summer and again but to a much smaller peak in winter, valleys resulting in spring and fall.

Appliance loads were related to "system" and "residential" peak. The system peak is the maximum hour of the combined loads of the three operating companies, readily available from load statistics. As actual system residential demand data are not available, selected residential laterals were test-metered and it was assumed that times of peaks on the combined loads of these laterals coincided with corresponding peaks on the total system residential load. Laterals selected were, insofar as practicable, representative of the total system residential load in annual kwhr per customer distribution and appliance saturations. There were about 1,400 customers on the laterals.

Thirty home freezers were tested for non-coincident periods. Peak demand for these is in the afternoon (Fig. 3), when ambient temperature is highest. This is directly on the system's annual peak. With an annual load factor substantially above that for the system as a whole, however, the freezer loads tend to improve overall residential load factor. Individual freezers ranged from 4 to 18.9 cu ft.

Monthly group peak demands varied from 115 to 231 w per freezer and in time of occurrence from 1:00 to 6:00 pm. Maximum clock hour demand for an individual freezer was 400 w and the largest 15-min demand 440 w.

July, with 124 kwhr per freezer, was the month of greatest usage; January, with 57 kwhr per freezer, the month of minimum usage. Monthly use for individual freezers varied from 12 to 252 kwhr.

Individual freezer load factors varied considerably. The lowest monthly load factor was 21.5, one freezer actually operating 100% of the time during a warm month. For freezers as a group, diversified monthly load factors, based on group peak demand, ranged from 50.6% in February to 71.3% in July. Data for a 12-month period are:

1,034 kwhr used per freezer per year

203 w per freezer annual group peak

58.1% load factor, based on annual group peak demand

58.1% load factor, based on demand at time of annual system peak.

Tests Lasted a Year

Demands, coincidence factors, and load factors for freezers are in Fig 4. Watts and kwhr per freezer, and load factor are in Fig 5.

Tests were made on 15 dishwashers with heating elements, all in single-family dwellings. Only two makes were tested; one had a ¼-hp motor and an 850-w heating element; the other a ⅓-hp motor and a 750 w heating element. Tests were for a full year.

The group peak demands for the two months varied very little. The 293 w per dishwasher for February was only 5.5% greater than the group peak for March. The individual 15-min demand ranged up to 1.37 kw. There was considerable variation in monthly kwhr usage for

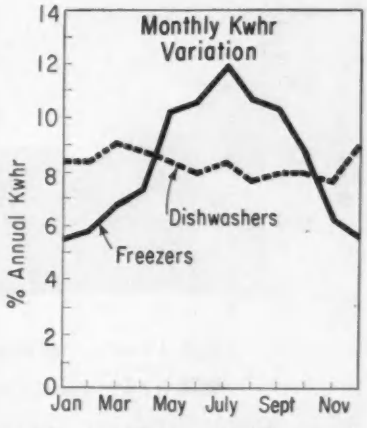


FIG 1—FREEZERS, dishwashers with heating elements have this use pattern

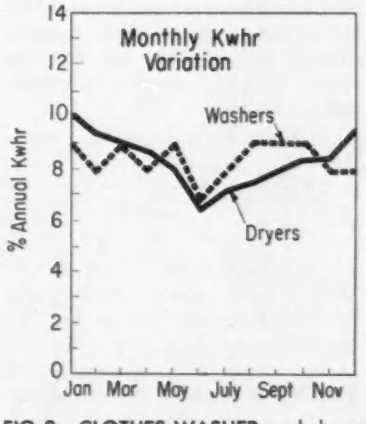


FIG 2—CLOTHES WASHER and dryer use drops off in the summer season

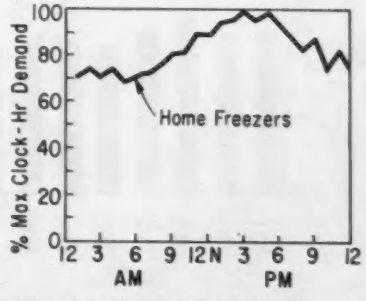


FIG 3—DAILY PEAK for home freezers occurs with afternoon temperatures

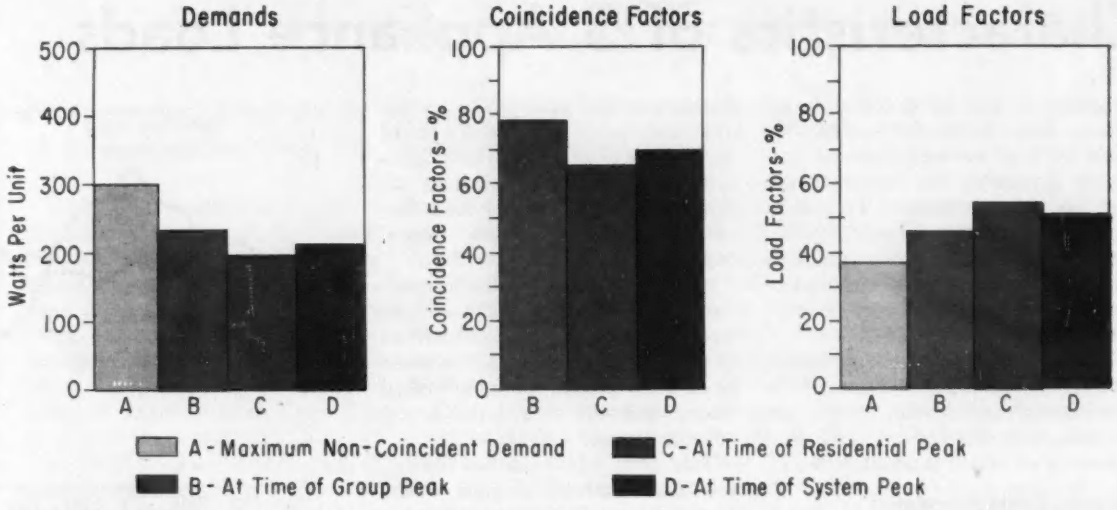

Demands
Coincidence Factors
Load Factors
Watts Per Unit
Coincidence Factors - %
Load Factors - %
A - Maximum Non-Coincident Demand
B - At Time of Group Peak
C - At Time of Residential Peak
D - At Time of System Peak

FIG 4—HOME FREEZERS, according to test data, have these demands, coincidence factors and load factors. Annual kwhr per unit are 935 for a group of ten. Some 30 home freezers were tested for non-coincident periods

individual units. Minimum usage for the month was 9 kwhr; the maximum 48 kwhr. For the group there was very little variation from month to month. The highest monthly average was 25 kwhr per unit; the lowest 21 kwhr per unit; the average 23 kwhr.

For the year, dishwashers averaged 274 kwhr per unit. Load factors were 10.6 and 11.2%, based on group peak demands for February and March, respectively. Pertinent data are in Table II.

Relationship of the dishwasher load curve for the February peak day to the system load curve for the same day is in Fig 6.

Composite Sunday, composite weekday, and composite Saturday load curves for dishwashers are in Fig 7. The weekday peak occurs at 8:00 pm, about the time of the residential peak. But the

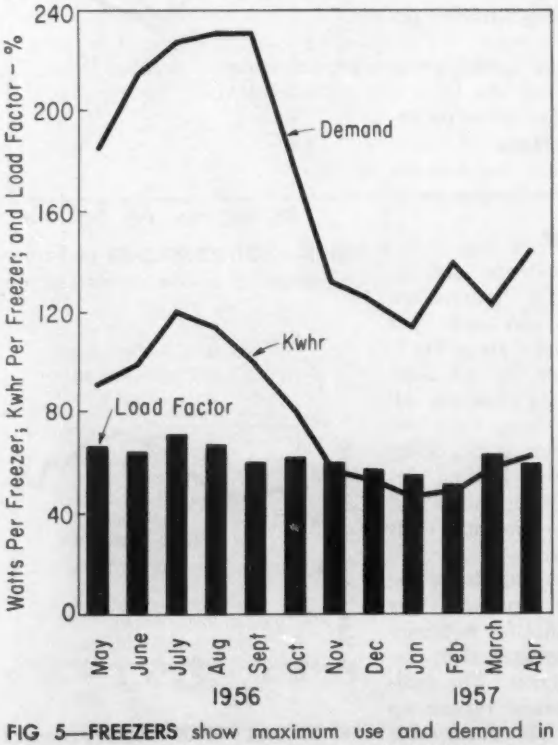


FIG 5—FREEZERS show maximum use and demand in the summer as well as a uniform monthly load factor

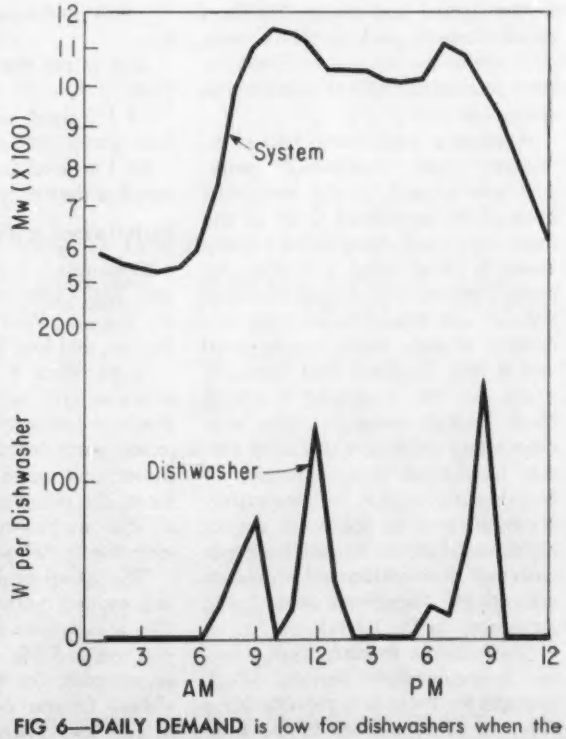


FIG 6—DAILY DEMAND is low for dishwashers when the system load is high, a factor favoring this type load

dishwasher contributes enough year-around demand to improve the overall residential load factor. The curves in Fig 7 were developed on the assumption that customer dishwasher use habits vary primarily as to whether it is a Sunday, a weekday, or a Saturday. The Sunday peak is in mid-afternoon, the weekday peak at 8:00 pm, and the Saturday load curve has three peaks of about the same magnitude at 10:00 am, 3:00 pm, and 8:00 pm.

Average number of dishwasher cycles per unit per day for a composite February week ranged from 1.1 on Thursday to 1.5 on Sunday. Total for the week was 8.9 cycles per dishwasher.

Annual kwhr for individual dishwashers ranged from 90 to 599, reflecting difference in use due to customers' habits and the number of persons in families.

Load data on TV was obtained through the audimeter-recordimeter method in Dallas, Tarrant, and 20 contiguous counties. Meters on representative sets record the times of TV operation.

Since electrical data, such as kwhr use and kw demand, are not available, these annual statistics were estimated. Average rating of a TV set was estimated at 200 w. Composite annual daily load data was estimated as follows:

Demand-W Per TV Set

Max Non-Coincident	Group Peak	At System Peak
200	132	37

(360 Kwhr Per TV Per Year)

Load Factor Based On Demand

Max Non-Coincident	Group Peak	At Time of System Peak
20.5%	31.1%	111.1%

Table II–Dishwashers, Average Test Statistics

(February and March, 1956)

	February	March
No. Tested*	9	12
Average Rated W per Unit	1,017	1,022
C'ock-Hr Demands per Dishwasher—W		
A) Max. Non-Coincident	829	730
B) Group Peak	293	278
C) At Time of Res. Peak	70	270
D) At Time of Sys. Peak	0	111
Average Kwhr per Dishwasher	26	25
Coincidence Factors—%		
A) At Time of Group Peak	35.3	38.1
B) At Time of Res. Peak	8.4	37.0
C) At Time of Sys. Peak	0	15.2
Load Factors In % Based On:		
A) Max. Non-Coincident Demand	4.5	4.6
B) Group Peak Demand	12.7	12.1
C) Demand at Res. Peak	53.4	12.4
D) Demand at Sys. Peak	—	30.3
Time of Demands		
A) Group Peak		
1) Date	7	19
2) Day of Week	Tues.	Mon.
3) Hour Ending	8 PM	8 PM
B) Residential Peak		
1) Date	3	12
2) Day of Week	Fri.	Mon.
3) Hour Ending	7 PM	8 PM
C) System Peak		
1) Date	2	27
2) Day of Week	Thurs.	Tues.
3) Hour Ending	10 AM	8 PM

* Note: Number of units tested varies from month to month due to metering difficulties.

Load curves in Fig 8 indicate the difference in viewing habits in summer and winter. The peak load, as shown by the load curve for an average weekday in June, Fig 9, occurs at 9:00 pm, about the time

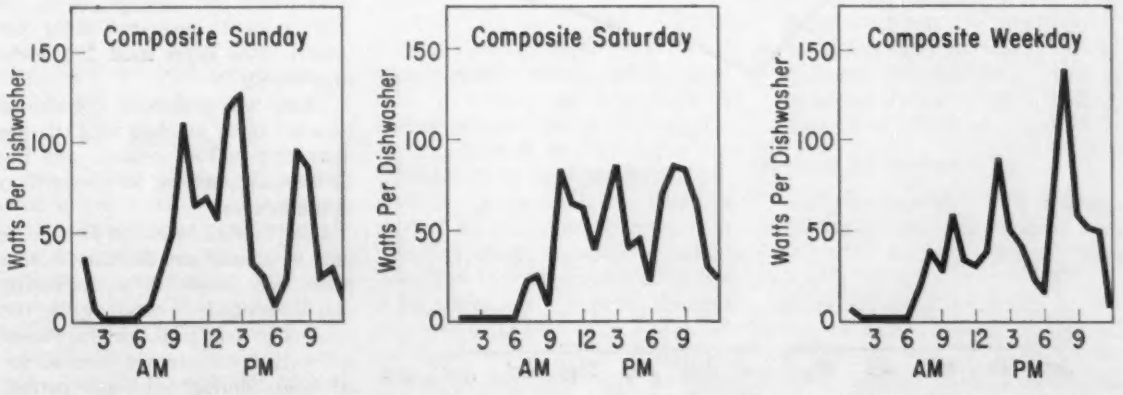


FIG 7—COMPOSITE DEMAND curves of dishwashers for Sundays, Saturdays, and weekdays in February give good picture of diversified load. Weekday peak occurs at 8 pm, approximately the time of the residential load peaking

of residential peak. Nevertheless the TV contributes enough year-around energy use to improve the overall residential load factor.

Clothes washers and dryers have about the same diversified daily load shapes, the washer peaking 1 hr before the dryer, Fig 10 and 11. Both demand periods are off the system and residential peaks at about 3:00 and 9:00 pm, respectively.

Clothes dryers tested were in single-family dwellings. Ratings of heating elements varied from 4.2 to 5.0 kw, averaging 4.57 kw. Thirty nine dryers were tested. A composite of all kwhr data shows

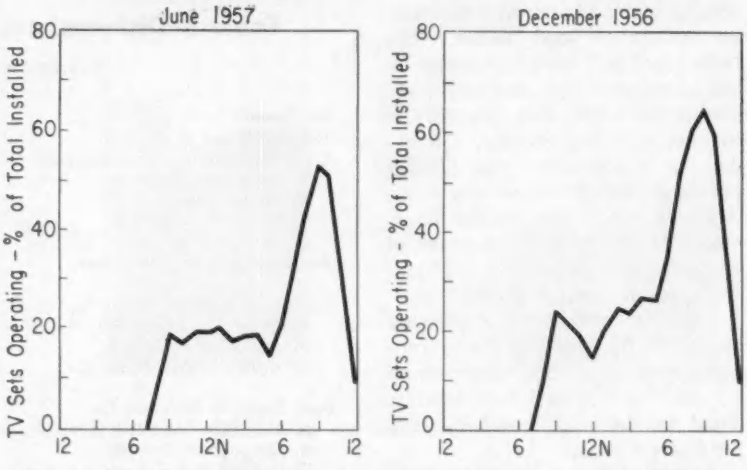


FIG 8—TV LOAD peaks at 9:00 pm, the peak rising higher in December than in June. Data on television was supplied to the utilities by a Dallas station

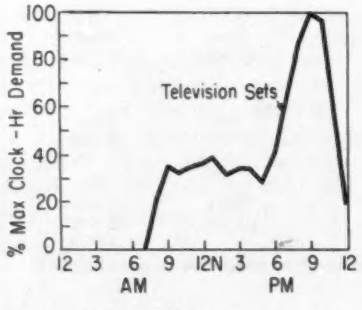


FIG 9—MAXIMUM TV use is at 9 pm

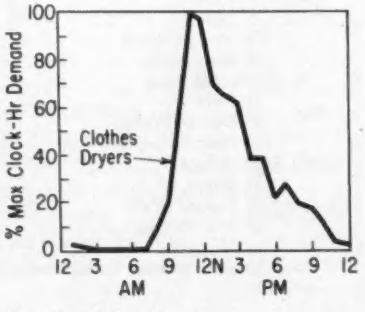


FIG 10—DRYER USE peaks near noon

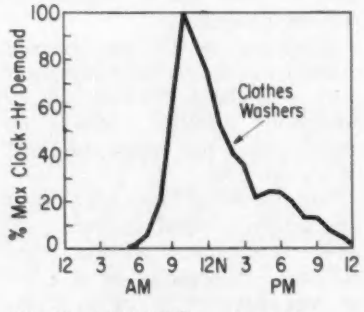


FIG 11—WASHERS peak at 10 am

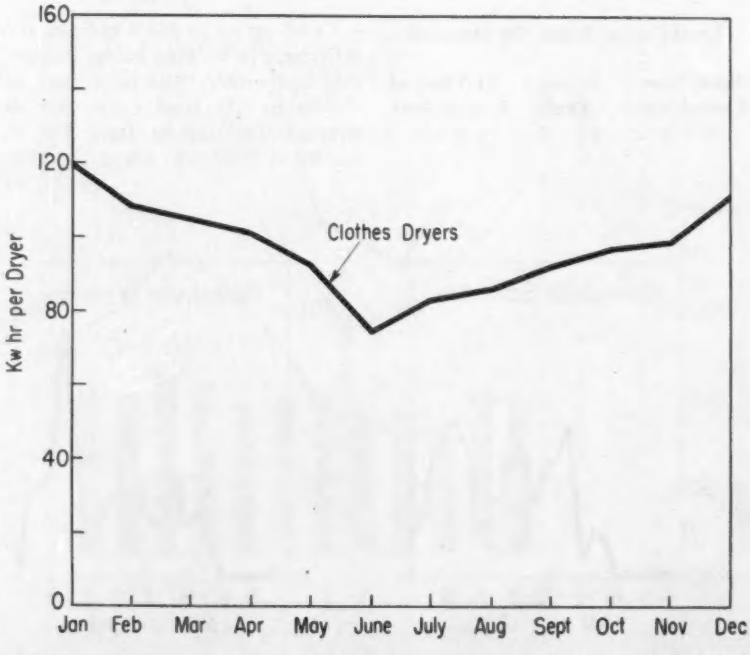


FIG 12—DRYER use shows some customers dry clothes outdoors in nice weather

that June was the month of lowest average use, 74 kwhr per dryer, and January highest with 119 kwhr per dryer. Average annual use for all units was 1,166 kwhr per dryer, an average of 97 kwhr per dryer per month. One dryer used 272 kwhr in a month.

There was a definite correlation between dryer use and weather, use increasing in bad weather, and Fig 12 shows higher use in winter than in summer.

Load factors, based on demand at time of annual and January system peaks, are above 100%, indicating that diversified demand during the hour of system peak for the period is less than the average demand for all hours during the same period. Average test data for all dryers are

Table III–Clothes Dryers, Average Test Statistics

(August, September, and October, 1955, January and February, 1956)
(Includes Units for Which Both Demand and Kwhr Data are Available)**

	August	September	October	January	February
No. of Dryers*	13	25	26	18	17
Average Heating Element Size—W	4,454	4,582	4,567	4,517	4,524
Clock-Hr Demands Per Dryer—W					
A) Max. Non-Coincident	2,807	3,187	3,271	3,471	3,478
B) Group Peak	803	1,015	1,092	1,312	852
C) At Time of Res. Peak	83	87	38	97	231
D) At Time of Sys. Peak	73	258	38	55	413
Average Kwhr Per Dryer**	82	99	98	108	99
Coincidence Factors—%					
A) At Time of Group Peak	28.6	31.8	33.4	37.8	24.5
B) At Time of Res. Peak	3.0	2.7	1.2	2.8	6.6
C) At Time of Sys. Peak	2.6	8.1	1.2	1.6	11.9
Load Factors in % Based On:					
A) Max. Non-Coincident Demand	3.9	4.3	4.0	4.2	4.1
B) Group Peak Demand	13.7	13.5	12.1	11.1	16.7
C) Demand at Res. Peak	132.8	158.0	—	149.7	6.16
D) Demand at Sys. Peak	151.0	52.7	—	—	34.4
Time of Demands					
A) Group Peak					
1) Date	1	24	10	24	24
2) Day of Week	Mon	Sat	Mon	Tues	Fri
3) Hour Ending	1 PM	11 AM	11 AM	12 N	11 AM
B) Residential Peak					
1) Date	8	19	5	18	3
2) Day of Week	Mon	Mon	Wed	Wed	Fri
3) Hour Ending	9 PM	8 PM	8 PM	7 PM	7 PM
C) System Peak					
1) Date	9	20	5	17	2
2) Day of Week	Tues	Tues	Wed	Tues	Thur
3) Hour Ending	3 PM	3 PM	8 PM	7 PM	10 AM

* Number of units included vary from month to month due to metering difficulties.
** Note that kwh shown here are only for those units for which demand data are available.

given in Table III, shown above.

Load shapes for monthly group peak days for August, September, October, January and February are in Fig 13. The curves show three peaks, occurring at 11:00 am, 12:00 noon, and 1:00 pm. They range from 803w per dryer for August to 1,312w per dryer for January.

Has Smaller Peaks

Relationship of the dryer load curve to the system load curve on the day of the system's annual maximum demand is shown in Fig 14. System peak occurs at 3:00 pm; dryer peak at 11:00 am. The dryer load has several smaller peaks, none of which occurs at time of system peak. The shape of the dryer load curve on the January system peak day resembles that for the August peak day. Annual load factor for dryers, based on their demand at the time of the annual system peak, is 182.3%.

Tests on automatic clothes washers showed that those in homes with electric clothes dryers were used appreciably more than those in homes without clothes dryers, Fig 15, indicating an increase due to the convenience of the dryer. Tests were made in single-family dwellings, a total of 77 automatic washers being tested. Ratings of washers varied from 1/6 to ½ hp, most at ⅓ hp.

Maximum group peak demand occurred at 11:00 am on a Monday for each month and ranged from 108 w for August to 65 w for January. Monthly energy use per washer varied very little. Based on a composite of all kwhr data available, the lowest use was 6 kwhr in June and the highest 8 kwhr per washer in six other months.

Based on composite months, the annual kwhr used per washer were:

In homes with dryers	104
In homes without dryers	68
Average of all homes	89

January LF Highest

Highest monthly load factor, based on group peak demand was 14.5% for January. August was low with 8.7%.

Relationship of the washer to the system load on the day of the annual system peak, Aug. 9, is shown in Fig 15. System peak occurred at 3:00 pm when washer load was

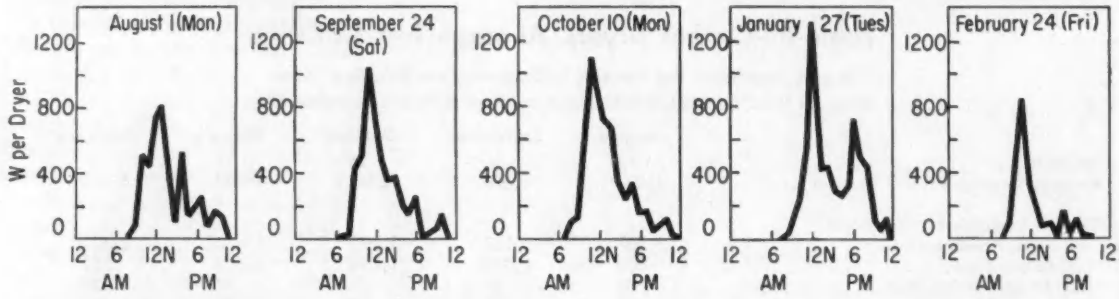


FIG 13—DRYER PEAK LOADS occur on different days of week in different months. Of the five months shown, two group peaks came on Monday, one on Tuesday, one on Friday, and one on Saturday. Three occur at 11 am

only 20% of maximum. The washer peak occurred at 12:00 noon, 3 hr earlier. Washers showed a smaller peak at 6:00 pm, when system load was decreasing.

At the time of the January system peak the washer peak occurred at 11:00 am and system peak at 7:00 pm. At the time of the January system peak the washer load is only 7% of maximum.

Washer demands always peaked on Mondays. Test data for all Mondays in August, September, and October 1955 and January and February 1956 were combined in Fig 16.

Data covers 866 "washer-Mondays." Peak demand, 63 w per washer, occurred at 11:00 am. Annual load factor for the average of all washers, based on this demand, was 16.1%.

The amount of energy used in this average day was 0.40 kwhr per washer.

Generally Applicable

While system load curves vary from one section of the country to another the comprehensive data obtained on appliance load characteristics are such that they can be applied to the load curve of any system. Use of a particular appliance is more likely to follow the same pattern from one area to another with perhaps some modification for washers and dryers which show less use in mild weather and for freezers which show increased use as temperatures go up.

Comprehensive tests are the only certain basis for assessing the cost to serve new electrical appliances. Even though actual cost on any system reflects the coincidence between its appliance load and system load, the data revealed by these tests can be applied as a measure of customer use of each type of appliance.

Load data of this type also find use in designing distribution to serve such appliances, particularly in high-use areas. The data can be evaluated to determine the probable demand of each residence and the coincident demand of groups of residences.

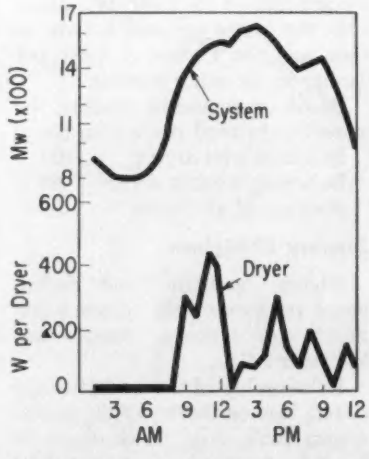


FIG 14—DRYER PEAK on day of annual system peak came at 11 am

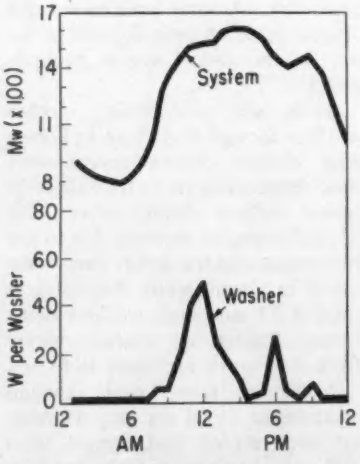


FIG 15—WASHER PEAK was three hours before the system peak

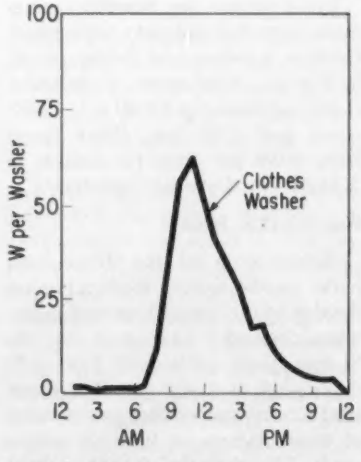


FIG 16—PEAK of 63 watts per washer occurred at 11 Monday morning

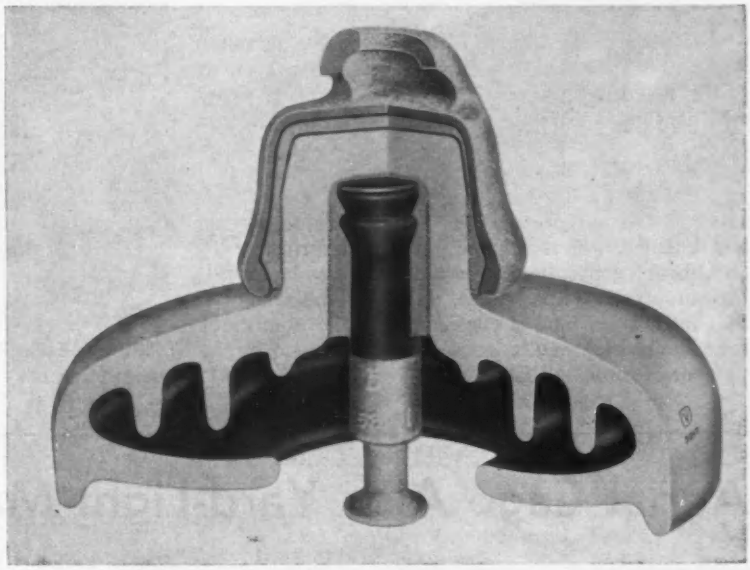
Fogbowl Keeps Contaminants Out

Protection against contamination on the underside of the unit is designed into a new Fogbowl suspension insulator by the Victor Insulators Division of I-T-E Circuit Breaker Co. This new concept provides an insulator for use in areas subject to salt fog or industrial contamination.

It features a specially designed bowl ceramically welded to a standard 10-in. suspension unit that creates a dead air space within the insulator.

This dead space almost completely eliminates contamination inside the insulator and should negate the need for periodic washing or replacement. The new insulator has a guaranteed minimum impact rating of 75-in.-lb, which is 36.4% greater than the rating for a standard suspension insulator.

To verify the design of the Fogbowl insulator, two West Coast utilities and a West Coast university have been testing about 400 new units and a number of standard fog suspension units for about five years.



PORCELAIN BOWL is welded ceramically to the inside of a standard 10-in. suspension insulator to create a dead air space

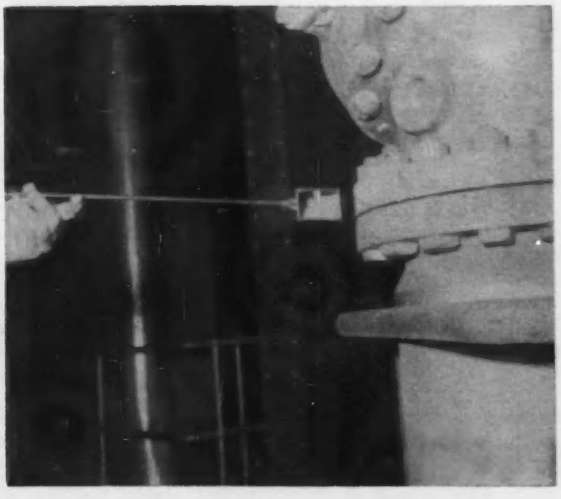
These conclusions then were drawn from the tests: "Lowering of the wet flashover voltage by contamination for the No. 961 Fogbowl type was less than one-half that for comparable fog-type suspensions; the unit also has lower surge and leakage current values." Also observed was "the almost complete absence of contamination on the inside of the Fogbowl type" which was subjected to a highly contaminated salt spray.

Long-Handled Mirror Finds Steam Leaks

B. R. VANCE, Unit Foreman, Central Operating Co, New Haven, W. Va.

Improved leak detection and increased safety result from using a long-handled mirror to detect leaks in boiler drum gage glasses, boiler header caps, high pressure steam valves, fittings, and welded joints.

The handle is made of ¼-in. steel rod about 2½ ft long. It is welded to a metal frame 1½ x 3½-in. which holds a mirror of the same size.



Lower Construction Costs with Fiber Forms

JAMES J. FAULS, Designer, Long Island Lighting Co, Mineola, N. Y.

Long Island Lighting Co has reduced costs of foundations up to 20% by the use of disposable fiber forms. A considerable saving in construction time has also been effected.

The fiber tubular form used is available in many standard sizes having inside diameters from 3 in. to 36 in. and lengths up to 25 ft. Wall thickness varies with the inside diameter to provide sufficient strength.

The forms were tested at a substation site with favorable results. Because of the savings in labor and material and the satisfactory appearance of the foundation, the company now uses fiber forms at all locations where they can be substituted for wooden forms.

Although conventional wooden forms may be reused, they are expensive to handle, transport, and maintain. The installation time is considerable. The number of foundations that may be poured is often limited by the number of forms available.

DISPOSABLE FIBER FORMS are inspected by the author. Use of forms has reduced construction costs up to 20%

Aerial Cage Aids Yard-Light Maintenance

EARL D. DABNEY, Maintenance Man, **RAYMOND G. ROSEBROCK,** Maintenance Helper, Clifty Creek Station, Indiana-Kentucky Electric Corp, Madison, Ind.

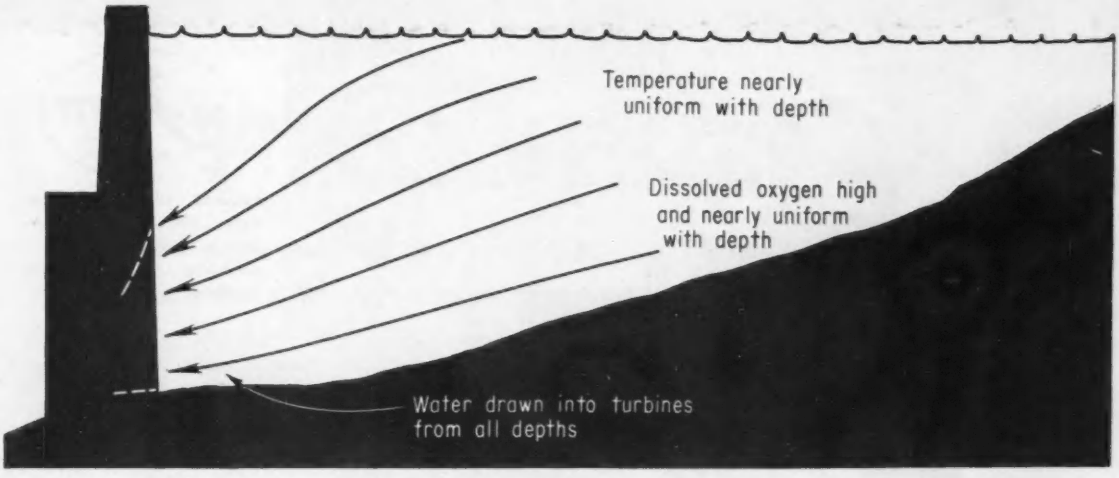
Maintenance of exterior lighting fixtures and work on coal conveyors or other structures are expedited by use of an aerial cage attached to the boom of a hydraulic yard crane. Besides permitting more efficient use of maintenance men's time, the cage extends the usefulness of the crane.

The aerial cage is used to replace bulbs in the outdoor street lights and transformer bays and to clean or repair the fixtures when necessary. Height and position of the lights are such that use of ladders would be hazardous and time consuming. When the boom is raised to its limit, the underslung, pivoted cage permits the occupant to work safely, even at a height of 40 ft.

The platform remains horizontal at any height, being pivoted on a 1-in. bolt. The cage and its attachment to the crane boom cost under $25, including materials and 4 man-hr for assembly.

First year's net saving from this expenditure is estimated at over $400, based on the saving in man-hr for maintenance of yard lighting alone. This work with a ladder would require 192 man-hr per year. With the aerial cage, two men, one in the cage and one for the boom operation, can do the job in 48 man-hr per year, a saving of 144 man-hr.

Special precautions must be observed when using the portable crane near energized lines. For example, the cage should not be occupied while the boom is being moved near energized conductors. The crane also should be grounded with a suitable cable.


Temperature nearly uniform with depth
Dissolved oxygen high and nearly uniform with depth
Water drawn into turbines from all depths

DURING WINTER the water at all levels in the reservoir mixes, effecting a uniform oxygen concentration throughout the whole body of impounded water. Cold water can hold more oxygen in solution that can water heated by sun

Dams Affect Water Properties

Reduced oxygen concentration in turbine discharge brings 'stream pollution' charges against hydro reservoir operators

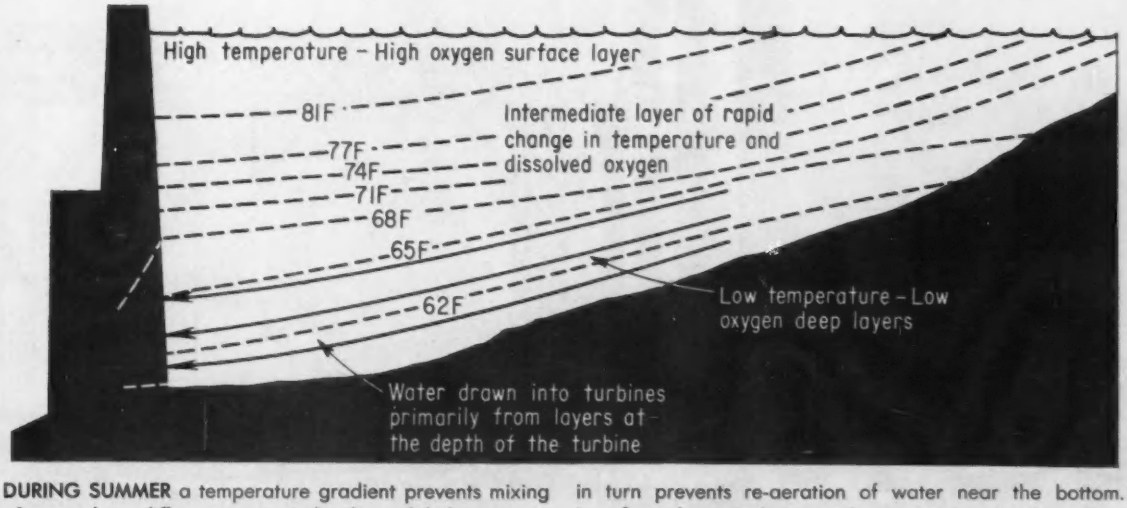
DR D. W. PRITCHARD, Director, Chesapeake Bay Institute, Johns Hopkins University, Baltimore, Md.

Stream pollution has been attributed by government agencies to some hydroelectric plants employing reservoirs, even though these plants discharge no waste into the water. But water impounded for turbine use undergoes changes in its oxygen content, this lowering of oxygen concentration being the sole basis of the complaint.

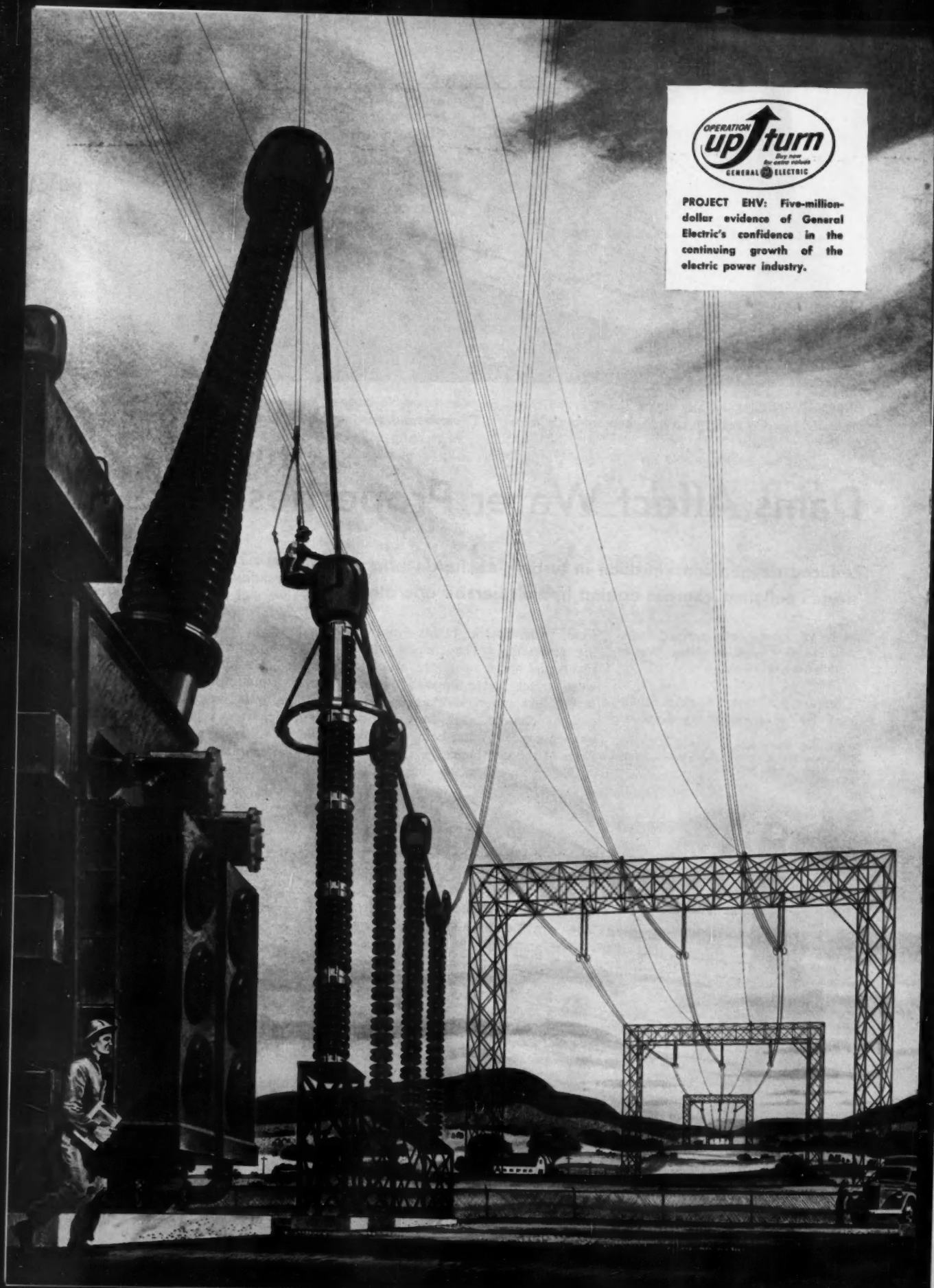
The properties of impounded water alter in certain summer atmospheric conditions. Top water becomes warmer than that at or near the reservoir bottom. The temperature gradient restricts the mixing of water from different levels, thus preventing re-aeration of the lower water. Aquatic life and the decomposition of organic matter deplete the deeper water of oxygen.

When mixing is retarded, the flow pattern of water going into the turbine intakes alters also. It

Adapted from paper presented at the Southeastern Electric Exchange, Engineering & Operation Committee meeting, Atlanta, Ga.


High temperature - High oxygen surface layer
81F
77F
74F
71F
68F
65F
62F
Intermediate layer of rapid change in temperature and dissolved oxygen
Low temperature - Low oxygen deep layers
Water drawn into turbines primarily from layers at the depth of the turbine

DURING SUMMER a temperature gradient prevents mixing of water from different reservoir levels, and failure to mix in turn prevents re-aeration of water near the bottom. Low flow also contributes to the summertime "pollution"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General Electric announces...

PROJECT EHV

An operating system for study of all aspects of extra-high-voltage transmission 460 to 750 kv

General Electric, with counsel from the electric utility industry, will build and operate a prototype EHV transmission system. Objectives are to help extend the electrical industry's knowledge of high-voltage phenomena and to anticipate the equipment that will be needed when EHV transmission becomes standard practice.

The line, 4½ miles in length, will parallel and be made a part of the Pittsfield-Lee portion of the Western Massachusetts Electric Company's system. Initial operation in early 1960 will be at 460 to 500 kv a-c, rising later to the 600- to 750-kv range. In 1961, as tests proceed at the 650-kv level, power will be diverted from the adjacent segment of the WMECO line through the EHV system.

Others co-operating in the project, in addition to Western Massachusetts Electric Company, are Stone & Webster Engineering Corporation, Aluminum Company of America, and American Bridge Division of United States Steel.

An Advisory Council representing electric utilities, will help determine exact project parameters and the nature and scope of research.

Expected areas of study include:

- Economics of various a-c super-voltages
- Lightning and switching surge performance
- Effects of conductor size, bundle and phase configuration.
- Mechanical performance of line
- Effect of conductor temperature
- Corona loss, radio and television interference
- Reduced basic impulse insulation levels

A wide variety of measurements with 200 instruments will be made at 15-minute intervals during all tests. Data will be processed through the 705 electronic data-processing machine at General Electric's Power Transformer Department, which is co-ordinating the project. Data will be correlated by analytical studies, model investigations and laboratory research in many G-E Departments.

For further information on PROJECT EHV, contact your G-E Representative or write for bulletin GED-3262, General Electric Co., Section 421-56, Schenectady 5, N. Y.

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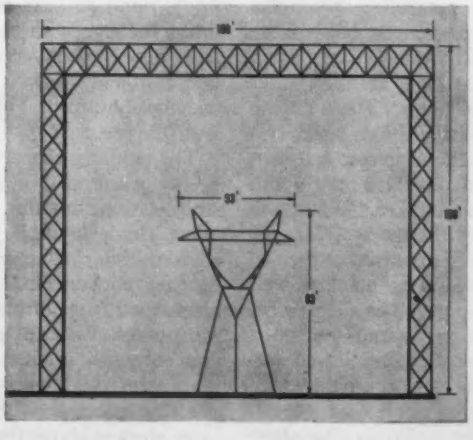
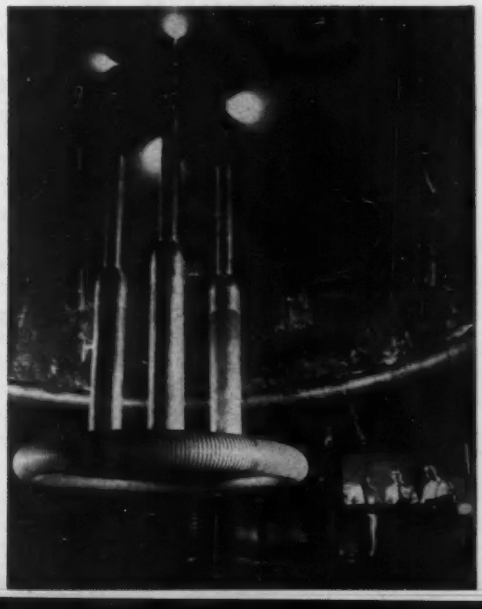
GENERAL ELECTRIC

PROJECT EHV portal-type towers, 158 feet high, 180 feet wide (here contrasted with typical present 230-kv towers), will allow varied conductor spacings and clearances.



PRELIMINARY STUDIES of apparatus and system are now under way. Here sample conductor bundle is tested for radio interference at G.E.'s Pittsfield High Voltage Laboratory.



ceases to flow from every reservoir level, and comes only from that layer at the intake level, having a more or less uniform temperature. As the intakes usually are near the reservoir bottom, only water of low oxygen content passes through the turbines.

Cold water holds more oxygen in solution than does warm water, the oxygen saturation of water at 50F being 11.3 ppm in contrast with 8.1 ppm at 80F. Oxygen content is used up by the decomposition of organic matter, such as industrial and human waste, dead aquatic organisms, and natural organic materials, such as leaves and twigs. Aquatic life needs dissolved oxygen to survive. Natural water bodies get oxygen by exchange with the atmosphere and from the photosynthetic activity of aquatic life.

May Deprive Aquatic Life

In a healthy impoundment, as in a stream, processes using oxygen are fewer than those contributing it, so that the concentration of this element is usually maintained near saturation. But new demands for oxygen can decrease its concentration to a point where aquatic life is deprived of it.

In streams without impoundments the oxygen concentration and the water's capacity for safely accepting waste are governed by the rate of flow. The higher this rate, the greater is the oxygen capacity to handle waste. Accordingly, the most critical period for water handling waste occurs during low flow. As periods of low flow are more frequent in summer, when the natural demand for oxygen is high and the oxygen saturation is lowered by the temperature, many factors combine to worsen water properties.

Impoundment itself, although originally thought to improve the assimilative ability of water, has aspects that complicate the problem. In summer in the middle latitudes impounded water tends to stratify, the surface layers becoming warmer than those deep down. This stratification increases the resistance of high-oxygen surface water to mixing with the deeper layers, so that the rate of oxygen renewal is reduced in the deeper layers. And this resistance occurs when the lower strata are being depleted of oxygen by decaying organic matter.

There is no stratification in winter, as the cooling surface layers and frequent winds keep the reservoir well mixed. Oxygen introduced at the surface by exchange with the atmosphere is mixed throughout the water body, producing a nearly saturated water at all depths. Water from every layer is drawn through the intakes as there is no thermal stratification.

Solar radiation increases as summer approaches. This radiation is absorbed primarily by the upper layers of water, causing them to warm and become less dense. The temperature differential brings stratification and, consequently, less vertical mixing of the water. Deeper water is cut off from the oxygen supplied from both the atmosphere and aquatic plants. These plants usually are in the upper water strata where sunlight is sufficient for photosynthesis.

In a season of moderate winds, the upper water has a high temperature which decreases only slightly through a 20-ft layer. But deeper than 20 ft, temperature drops rapidly with depth in region called the thermocline. Below this thermocline, there is frequently a cold layer of nearly uniform temperature, but often temperature continues to decline all the way to the bottom. In calm weather, the thermocline may extend nearly to the surface, or near the surface a second thermocline may develop.

Oxygen Depletion Varies

Water discharged from a turbine draws water of the same density toward the dam, the amount of drag induced by the flowing layer on adjacent ones depending on the difference in temperatures. When the temperature gradient is large, little drag is exerted among layers; when small, a flowing layer entrains water from adjacent layers. Thus, during the summer stratification, water discharged from the reservoir is drawn primarily from layers at the depth of the turbine intakes. When the intake is below the thermocline, the concentration of dissolved oxygen in the discharged water may be well below saturation. The degree of oxygen depletion depends on:

1. Volume of water stored below the thermocline compared with the mean daily discharge. Reservoirs with large retention time show large oxygen depletion.

2. Depth of turbine intakes.

3. Age of impoundment. Organic material left on the land which was inundated continue to need oxygen for several years.

4. Local climatic conditions, such as the amount of solar radiation, frequency and intensity of winds, and degree of night cooling.

5. Character of reservoir flow.

Retention Time Has Affect

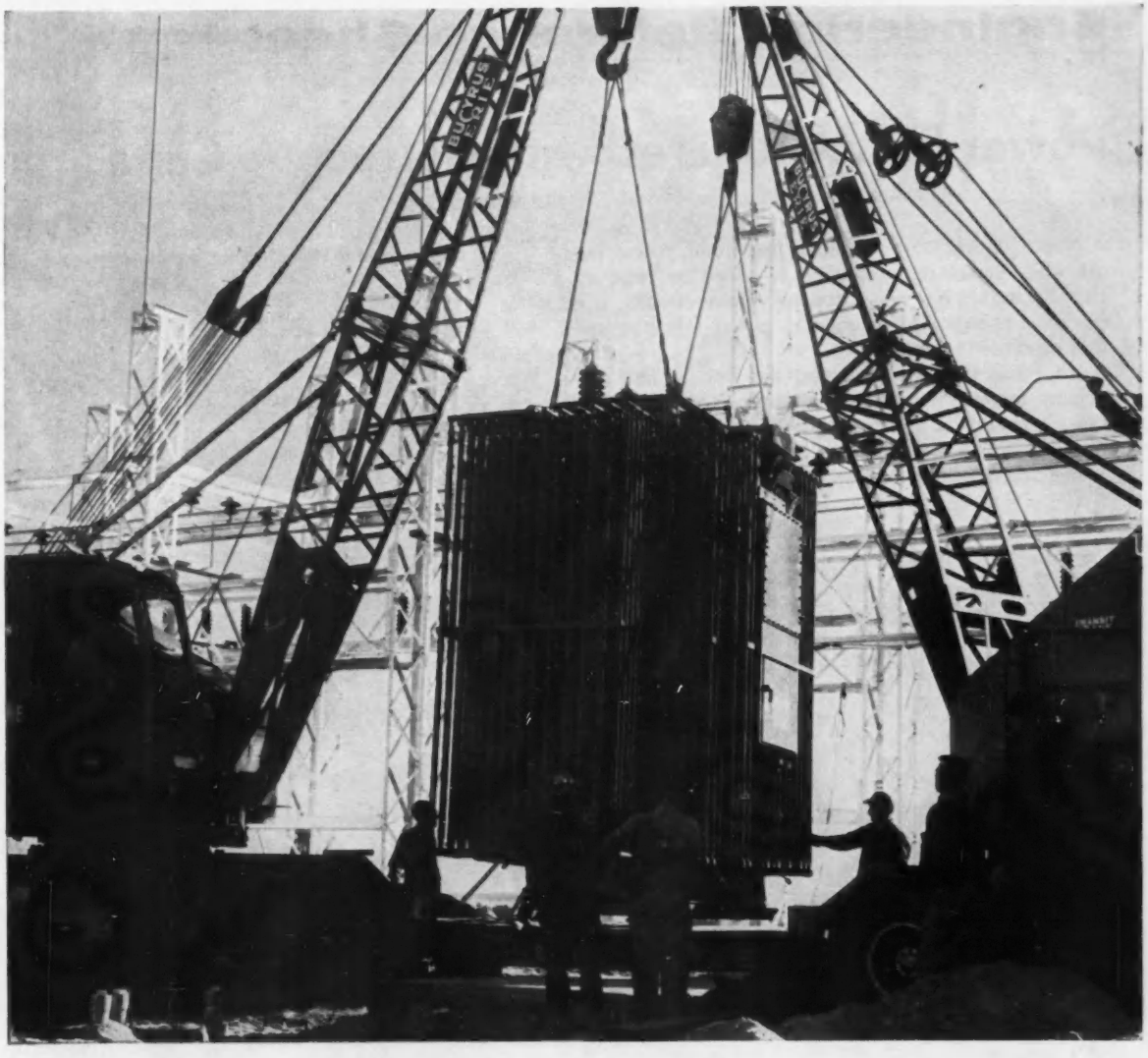
Small run-of-river reservoirs, having a retention time of less than ten days, generally exhibit only a weak thermal gradient, and oxygen depletion is not severe. But a reservoir below a larger one which has a long retention time and deep turbine intakes, usually has a discharge with oxygen depletion.

This results from the larger reservoir's discharge being cold and depleted of oxygen. The cold discharge sinks below the warm surface of the downstream reservoir, thus intensifying normal stratification. When the downstream turbine intakes are deep, the cold flow passes through the lower impoundment without re-aerating.

The overturn in early fall ends thermal stratification. This phenomenon is caused by the decrease in solar radiation, the advent of cool nights, and the increase in mean wind velocity. Surface layers begin to cool, and surface mixing extends to lower depths until the reservoir loses its stratification, and temperature from top to bottom is nearly uniform.

Mixing waters of high and low oxygen concentration often produces a mixture relatively low in dissolved oxygen at all depths. This brief condition lasts only until natural exchange with the atmosphere adds dissolved oxygen. During the late fall and winter, the reservoir becomes almost uniformly saturated with oxygen.

The peaking characteristic of the power plant also affects reservoir stratification, but this is a transient affect which should be evaluated for each reservoir. One way to improve the oxygen concentration of water discharged from turbines is to raise the intakes. Water of greater oxygen concentration is then drawn from higher reservoir levels. This is especially effective when there is a large storage above the thermocline.



RM standard-design medium transformers apply in 90% of the cases where "specials" seem to be indicated*

*Are unreviewed application practices costing you the savings offered by standardization of medium transformers (501 to 7500 kva, 69 kv and below)? 416-20

General Electric Co., Schenectady 5, New York.

Progress Is Our Most Important Product

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Power Factor Related with Corrective Capacitor

LAURENCE B. STEIN, Jr., Electrical Engineer, The Fisher-Pierce Co., South Braintree, Mass.

Nomograph shows the effect on circuit power factor when capacitive correction is added or removed. Equally usable for single and polyphase circuits, it is designed to save computation in power factor correction problems.

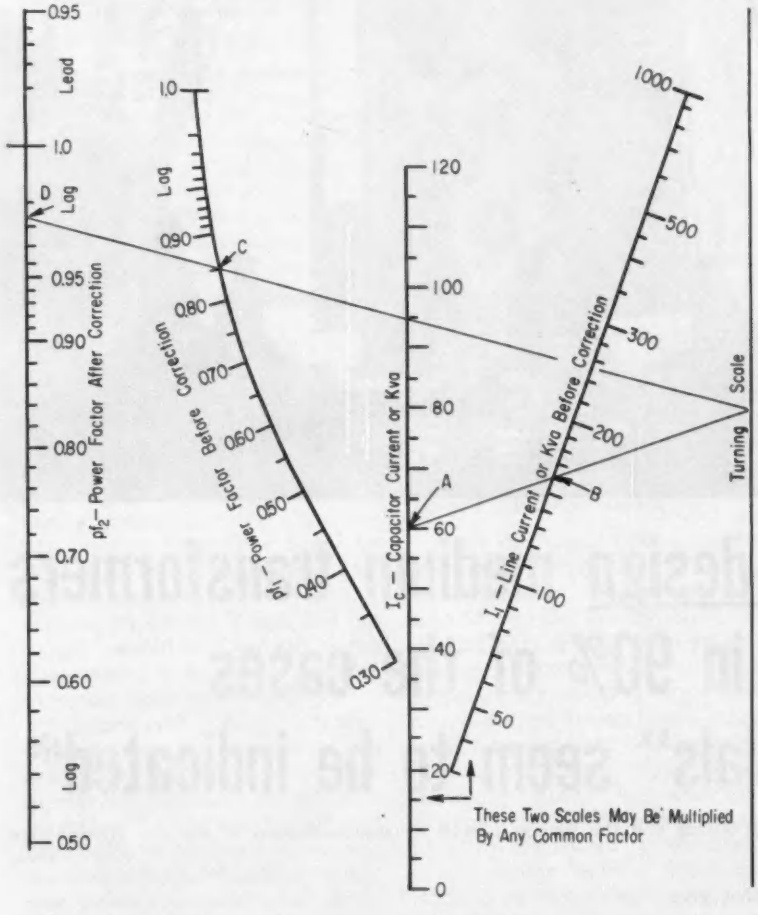
To relate the four variables, the straight line connecting quantities on the two current (or kva) scales must intersect at the turning scale with the straight line connecting the quantities on the two power factor scales at the left side of the nomograph.

This nomograph is based on the equation:

$$\frac{I_c}{I_1} + \left[\tan\left(\cos^{-1} pf_2\right)\right] pf_1 = \sin\left(\cos^{-1} pf_1\right)$$

Where:

I_1 = Line current before correction
I_c = Capacitor current
pf_1 = Power factor before correction
pf_2 = Power factor after correction



Examples for Use of Nomograph

1. A 60-amp capacitor current (A) is added to a circuit carrying 160 amp (B) at 0.85 pf lag (C). Resulting power factor is 0.984 lag (D).

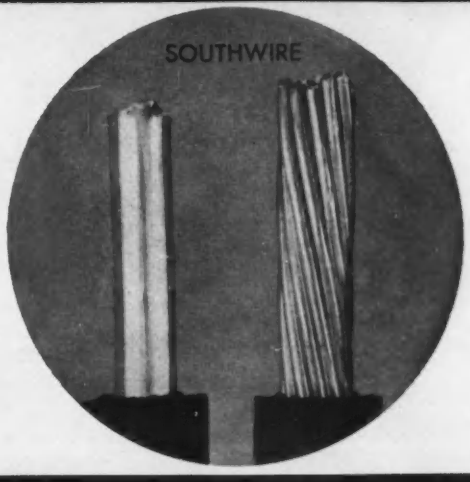
2. Using the same transverse lines, a 160-kva circuit (B) operating at 0.85 pf lag (C) may be improved to 0.984 pf lag (D) by the addition of 60 kva capacitive correction (A).

The turning scale represents the quotient I_c/I_1 laid out on a linear scale. This quantity need not be evaluated in the solution, so the turning scale is not calibrated. Since the turning scale is a ratio, the two current scales may be multiplied by a common factor.

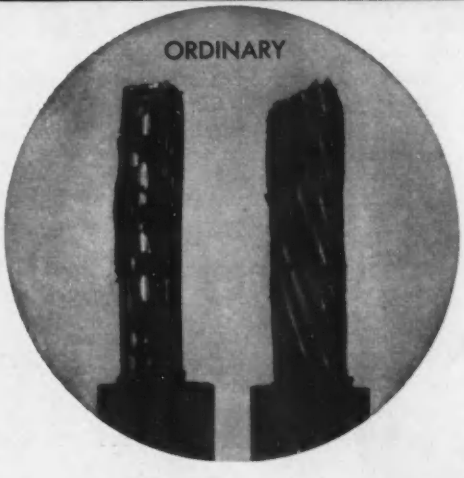
Line current I_2 (or kva) after correction may be calculated by multiplying the current before correction I_1 (or kva) by the ratio of the power factor before correction to the power factor after correction.

$$I_2 = I_1 \frac{pf_1}{pf_2}$$

100% FREE STRIPPING



ACTUAL UNRETOUCHED PHOTOS
ENLARGED THREE TIMES
SHOW THE DIFFERENCE



Southwire NEOPRENE covered copper wire

- **Strips Many Times Faster**
- **No Scraping Necessary for Connections**
- **No Sticking or Discoloration**
- **No Premium in Price**

ANOTHER SOUTHWIRE FIRST!

The one single headache associated with Neoprene Covered Copper Wire—sticking and discoloration—has been eliminated by Southwire. After three years of exhaustive research, testing, and development, Southwire now provides a completely new compound that is 100% free stripping. None of the manifold advantages of Neoprene covering have been sacrificed. You get a far superior product at no premium in price when you specify Southwire Neoprene Weatherproof Copper Wire.

• FREE SAMPLES AND TECHNICAL DATA ON REQUEST

SOUTHWIRE serves the world

Southwire® Company

TErrace 2-6311 CARROLLTON, GEORGIA

with these quality products:

- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and VWP* (Vinyl) Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories

• ALSO FABRICATORS OF COPPER AND ALUMINUM FOR WIRE AND CABLE MANUFACTURERS

L&N Builds Reactor Simulator for Exhibition

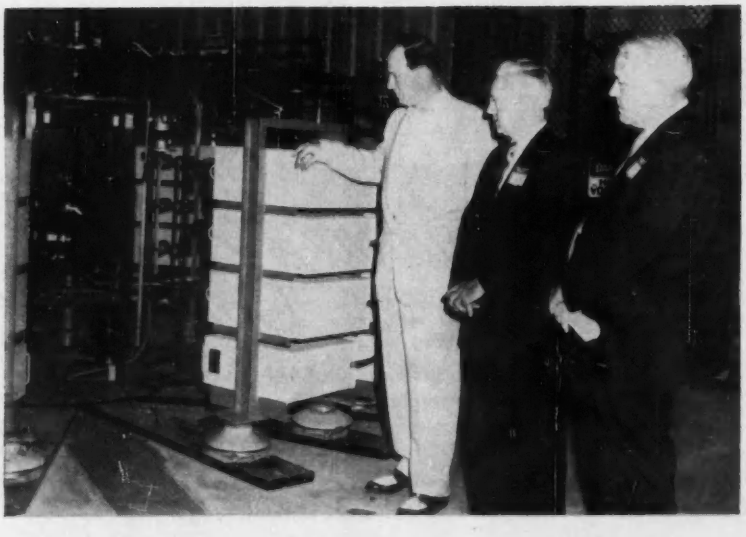
A reactor simulator that precisely duplicates operation of Argonne National Laboratory's experimental boiling water reactor has been built for the Atomic Energy Commision by Leeds & Northrup Co, Philadelphia, Pa. Shown above, it will be part of the United States exhibit at the Second International Conference on Peaceful Uses of Atomic Energy at Geneva, Switzerland, beginning September 1.

The $90,000 simulator comprises a full-scale working reproduction of controls and instruments for the EBWR at Argonne National Laboratories. Using it, an operator can exactly simulate start up and operation of the reactor and associated power generating equipment. The control panel contains instruments that indicate and record operation on the simulated reactor. These readings come from an electronic analog computer that makes controls present simulated readings of such data as neutron population, rate of energy release, reactor and steam temperature and pressure, and other conditions.

By manipulating proper controls the operator can actually bring the model to proper power level and turn it over to automatic operation. An operating mistake that might damage an actual reactor plant will cause the computer controlled model to do exactly what controls of a real reactor would do—take charge until the model is again operating properly.

Following its demonstration at the Geneva Conference, the simulator will be returned to ANL where it will be used to train reactor operators. Until now ANL, although charged with training of student operators, has been understandably reluctant to permit students to experiment with the actual EBWR controls. The new simulator is expected to speed training and make it more thorough and effective, AEC officials stated.

Hubbard Has Open House at Research Laboratory



Hubbard & Co welcomed 75 guests from all segments of the electrical industry for an open house at the company's new $1.5 million research laboratory in McCook, Ill., on July 22. (EW, July 14, 1958, p 72). Members of the Hubbard staff conducted groups on tours and explained the facilities.

In the group shown are C. H. Levee, left, director of the Hubbard laboratory, with A. E. Patton, vice president of Commonwealth Edison Co, and J. C. Sackman, vice president of Northern Indiana Public Service Co. Levee points out the lightning arrester test equipment, one of the laboratory facilities.

(*More Manufacturers News, p.* 65)

to solve system problems for the industry"

"Concentrate on all new and long-range electric utility industry system problems . . . devote all your time and efforts to their solution. That's the clear-cut assignment for the special staff of engineers who comprise the Westinghouse Electric Utility Engineering Department.

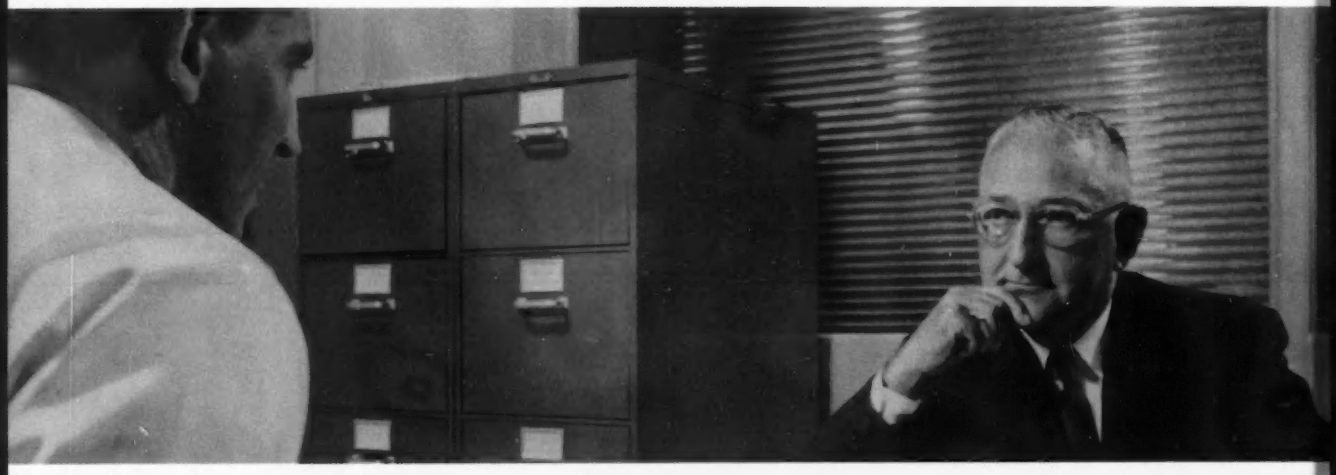
"Their studies of the *complete* power system go beyond the 'how-it-works' boundary. They search for and add to the 'why' knowledge.

"Through the Westinghouse policy of plowing back earnings into long-range system studies, these engineers are continuing to develop basic concepts for the power systems of today and tomorrow. This work is reported on the following pages."

J. K. Dillard, Manager
Electric Utility Engineering Department
Westinghouse Electric Corporation

In the Westinghouse Electric Utility Engineering Department . . .

Creative engineering is at work



on super power systems of the future

SPONSOR ENGINEERS PROBE THE FUTURE WITH ELECTRIC UTILITIES

During periodic visits to electric utilities, Sam Griscom and his fellow-Sponsor Engineers provide vital personal communication between engineers in utilities and those in the Westinghouse Electric Utility Engineering Department.

Sponsor Engineers discuss original investigations and counsel on the latest findings of long-range studies at Westinghouse. They review future system plans with utilities and search for problems that call for extensive probing or task force attack. The result—new techniques for system planning, better-engineered systems for tomorrow.

Through their advanced work in the Westinghouse Electric Utility Engineering Department, Sponsor Engineers have acquired special skills and a special knowledge of the utility power system. Through their contacts with electric utilities throughout the country, they have dug to the bed-rock of a great many field problems. They have anticipated and solved others.

ADVANCED DEVELOPMENT ENGINEERS TACKLE LONG-RANGE PROBLEMS

To Derrill Shankle and his group of Advanced-Development Engineers, the power systems of the future are a challenge . . . a set of problems that demand solutions . . . today.

For example, in the power systems of tomorrow, the selection and location of generating units will be a far more critical problem than it is now. Computer programs must replace today's rule-of-thumb procedures to permit the consideration of more factors and alternate plans. Westinghouse Advanced Development Engineers are perfecting these programs now.

At the same time, they are developing digital techniques for the study of economical load flow, short-circuit and transient stability . . . new tools for the system planning engineer.

As the voltages for transmission increase, so do the problems of radio influence, corona loss and excessive lightning outages. Through the Westinghouse policy of plowing back earnings into long-range studies, the entire industry is gaining new knowledge concerning all these phenomena—knowledge that will be necessary for easy transition to the super voltages of the future.

DISTRIBUTION ENGINEERS EXPLORE NEW CONCEPTS OF SYSTEM PLANNING

In the next seven years, electric utilities will add enough generation to power another America. Distributing that power economically, presents challenging problems that demand imagination and creative thinking.

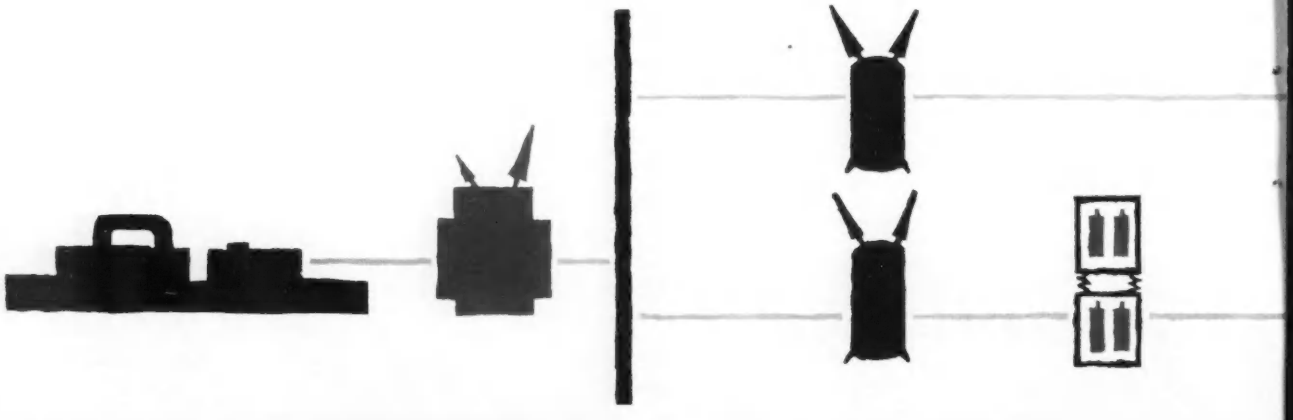
Bob Lawrence and his staff of Distribution Engineers are answering this challenge by exploring countless new and promising concepts of long-range system planning.

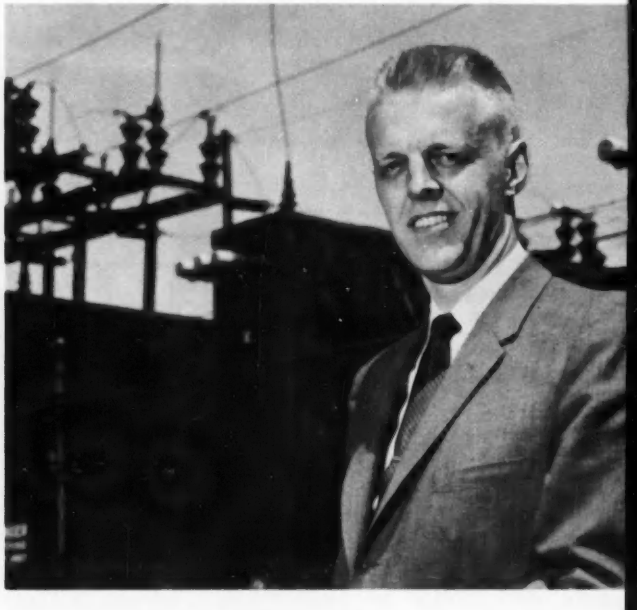
- What subtransmission, primary- and secondary-voltage levels should be used to serve the future load?
- Which equipment-circuit arrangements will be both economical and reliable?
- What about feeder capacities . . . substation sizes and locations?

These are a few of the areas in which answers are being sought today by the Westinghouse Distribution Engineers.

YOU CAN BE SURE...IF IT'S **Westinghouse**

From generation to distribution, Westinghouse





SPONSOR ENGINEER HELPS UTILITY PLAN TIE-IN OF SUPERCRITICAL UNIT

When the turbine-generator is a radically new design, the problems of tieing it into a system are greatly accentuated. A good example is the 5000-psi *supercritical* Eddystone Unit No. 1 of the Philadelphia Electric Company.

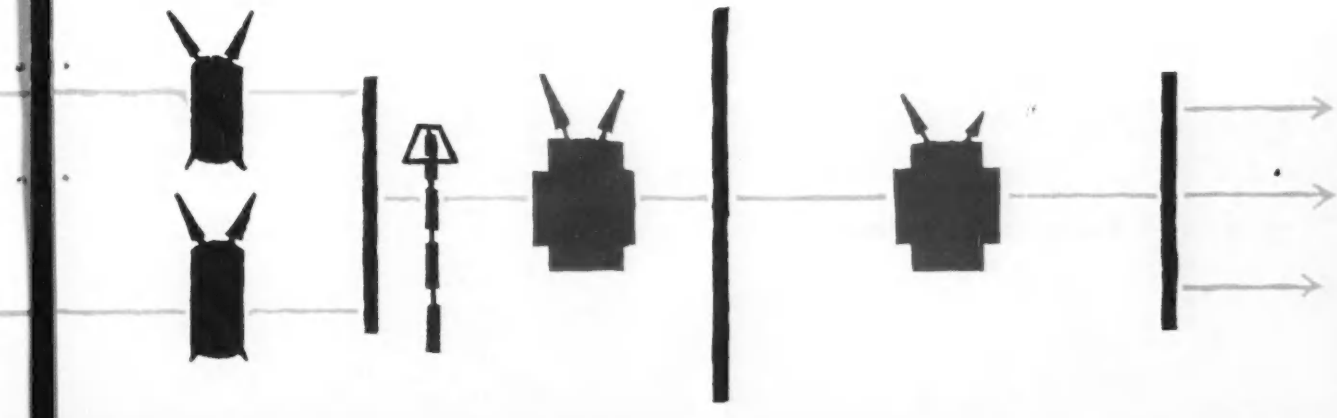
Working with the utility engineers, Chuck Wagner investigated the effects of the characteristics of this design on the stability of the unit with the system. He also helped determine the protection and operating requirements. These investigations will provide the industry with the answers for other large units, as they gain more widespread application.

PREDICTS PERFORMANCE OF SERIES CAPACITOR APPLICATIONS

By cooperating with utilities that are now designing modern high-voltage transmission systems, Westinghouse Sponsor Engineers are getting data that will benefit the entire industry.

For example, Ted Bliss helped several utilities engineer future series capacitor applications. In doing so, he investigated the possibilities of ferroresonance, transient overvoltages, and subsynchronous operation of induction motors. Drawing on the modern analytical facilities at Westinghouse, Ted Bliss determined the protection and operating procedures required for these installations.

Sponsor Engineers are ready to help



IF ONE LIGHTNING ARRESTER DOES THE JOB, WHY USE MORE!

As the result of a field study with the engineers of the Louisiana Power and Light Company, Sponsor Engineer Jim Clayton (above) and Advanced Development Engineer Bob Hileman have collected data that will help the industry apply lightning arresters on a more realistic and economical basis.

Through a traveling wave analysis, they are able to determine surge voltages at all points remote from the arrester. They have found that in many substations, it's possible to protect the entire station with a single set of arresters. The safe use of fewer arresters is now possible.

20-YEAR DISTRIBUTION PLAN TO MEET ZOOMING RESIDENTIAL LOAD

Within 20 years, today's residential loads will increase threefold. That was the first report of an extensive study made for a southwest utility.

Working closely with the utility engineers and their consultants, Westinghouse Sponsor Engineer Miles Maxwell prepared a 20-year plan for the distribution system. Flexible and complete in every detail, this long-range plan provides for 12-kv voltage as the most economical.

Through long-range studies such as this, Westinghouse Sponsor Engineers are helping the industry plan for fast-growing residential loads.

YOU CAN BE **SURE**... IF IT'S Westinghouse

Special industry problems call for

WESTINGHOUSE TRACES MYSTERIOUS FAILURES OF LIGHTNING ARRESTERS TO SWITCHING SURGES

Advanced Development Engineers and Sponsor Engineers often serve as task forces to investigate apparatus failures that can't be readily explained.

For example, John Skooglund (above) and Cliff Lane checked the mysterious failure of a lightning arrester on a 345-kv system. Field measurements with high-speed cathode-ray oscillographs and extensive analog computer studies proved that the trouble was caused, not by lightning, but by disconnect switching surges.

Westinghouse then developed a series resistor device for disconnect switches that effectively dampens high-voltage surges. Thus, Westinghouse has given the industry the answer to a problem that defied solution for many years.

JOINT PROGRAM IS DEVELOPING ACCURATE COMPUTER TECHNIQUES FOR EXPANSION PLANS

Westinghouse Advanced Development Engineers are working on computer studies that will provide the industry with more accurate data for long-range expansion plans. A joint project is now under way with the Public Service Electric & Gas Company of New Jersey.

Clarence Baldwin of Westinghouse (above) and Charles H. Hoffman, Public Service Electric & Gas Co. engineer, recently reported that study groups are now developing advanced techniques of evaluation and computer logic in areas such as these —load forecasting, retirement of units, risk of shortage, transmission plans, yearly dispatch and production cost, capital cost determination and present worth economics.

special skills and special facilities

REVOLUTIONARY DIGITAL COMPUTER PROGRAM SOLVES VOLTAGE-CONTROL PROBLEM

Every regulator and capacitor application should be engineered, but engineering man power is too expensive to spend on repetitive analyses.

Working with the American Electric Power Service Corporation, Dave Reps and his associates in the Distribution Engineering section have perfected a digital computer program that solves typical primary feeder problems.

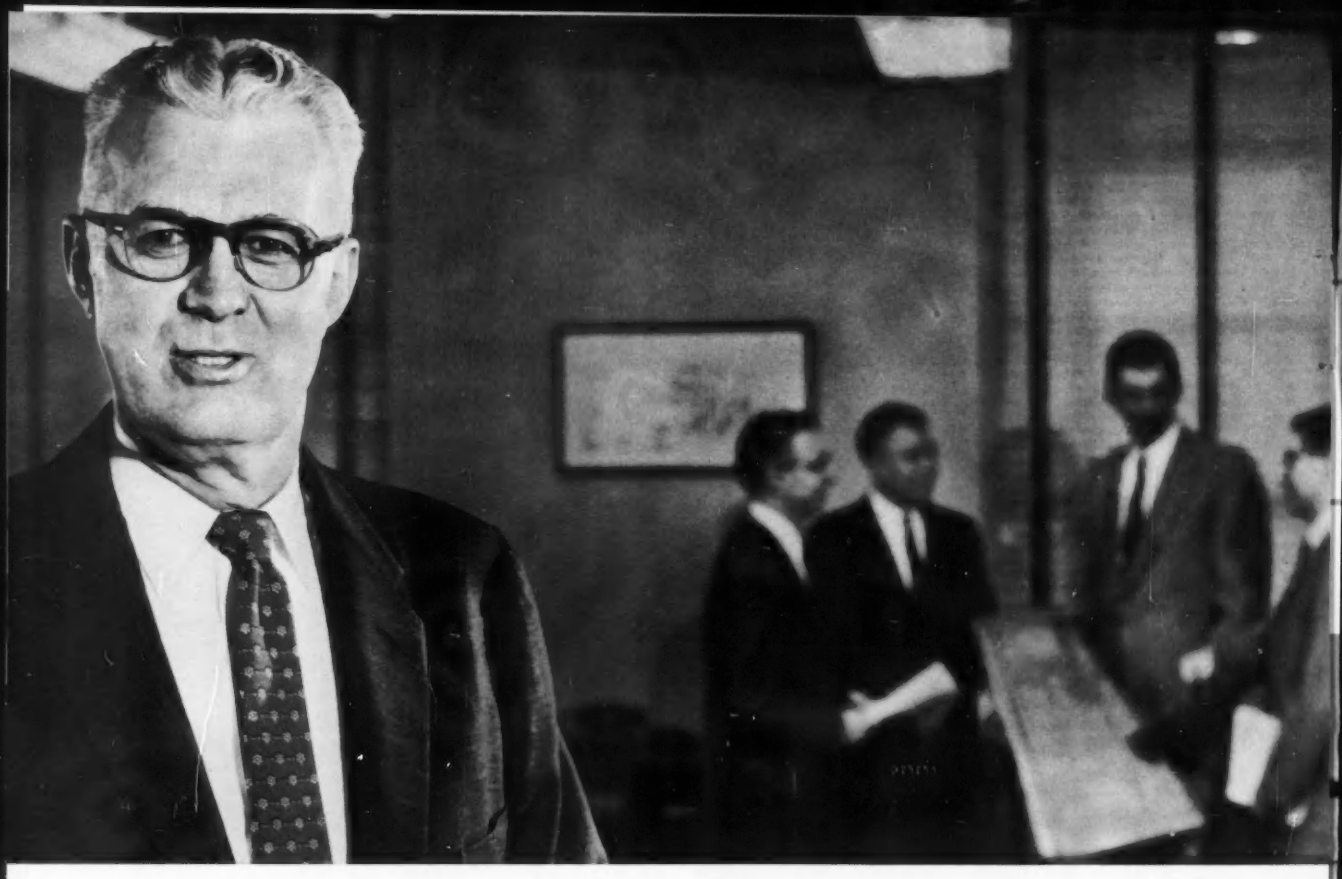
One hour is required to record the utility data on cards or tape. In one minute, the 704 computer calculates the solution—the ratings and location of the regulators and capacitors, and total application cost for alternative methods of controlling voltage on the feeder.

25% SAVINGS WITH HIGHER SECONDARY VOLTAGES FOR NEW ALL-ELECTRIC HOME AREAS

Through plowback of earnings into extensive distribution studies, Westinghouse has assembled data that clearly indicates the need for immediate consideration of higher secondary voltages for new residential areas.

All-electric homes with electric heating and cooling make present voltage systems uneconomical in most cases. Studies by Hank Lokay and his fellow Distribution Engineers show that higher secondary voltages in all-electric home areas would result in savings of at least 25 per cent. With such a system, a hundred or more homes would be served by a single transformer which, in turn, would be served by higher voltages . . . possibly 34.5-kv.

YOU CAN BE SURE...IF IT'S Westinghouse



Through coordinated project planning . . . you can save time and gain many services

Here is a time-saving service for the electric utility that selects the most *complete* line of advanced and coordinated apparatus for a new or expanded station.

Working with the electric utility and its consulting engineer, the Project Section of the Electric Utility Engineering Department can offer contributions based on the special knowledge and experiences highlighted on the previous pages. Carey Mann and his Project Engineering team can coordinate the project requirements with the many services in Westinghouse. You gain the advantages of one order, one contact, one responsibility.

HERE'S HOW THE INDUSTRY BENEFITS FROM WESTINGHOUSE LONG-RANGE STUDIES OF SYSTEM PROBLEMS

Through the Westinghouse policy of plowing back earnings into special and long-range studies, Electric Utility Engineers concentrate on the development of new system concepts that will help the industry meet future loads.

These engineers pass on the results of their work to the industry through Sponsor Engineers, AIEE papers and annual conferences with electric utility engineers. They also author the *Transmission and Distribution Reference Book*. Its value as the standard reference work on utility systems is proved by the sale of more than 50,000 copies.

Westinghouse considers this work of helping plan, evaluate, test and apply new ideas and systems its obligation to the industry . . . an obligation which it will continue to fulfill in the future as it has in the past.

CP-1048

YOU CAN BE SURE...IF IT'S Westinghouse

Water-Thinned Insulating Varnish Cuts Fire Hazard

A water-reducible insulating varnish that will reportedly neither burn nor support combustion, is known as Ajax Emulsion insulating varnish. It is a development of Sherwin-Williams Co, Cleveland, Ohio.

Ordinary tap water is used to thin the new varnish. D. S. Gaarder, manager of the paint firm's industrial division, said "Despite the fact that water is used, the emulsion insulating varnish does not absorb any more moisture from the air than do solvent type varnishes". He continued, "In addition, the new material has superior dielectric strength and is unaffected by transformer oils now in general use. Chemical and solvent resistance are also excellent, as performance tests with sulphuric and caustic soda and acetone, toluol, VM&P naphtha, ethyl alcohol and mineral spirits have shown".

An indication of the degree of protection the insulating varnish provides is shown in the results of a 1½ hp, 3-phase, Class A motor tested on a cycle based on AIEE test code 1-C, Paper No. 510. The motor was reversed every 6 sec for 24 hr a day and 221 F was maintained. The reversing was continual for over 3100 hr before failure when the varnished fabric deteriorated.

Here is a Peek at Some New Products

• Dual range is a feature of the Lincoln Type PW polyphase watthour/watt thermal demand meter. The manufacturer, Sangamo Electric Co, Springfield, Ill., reports the meter is a good choice for installations where future load growth is anticipated.

• Two pre-insulated connectors for underground network cables are an addition to the line manufactured by Dossert Mfg Co, Brooklyn, N. Y. The Micon connector, used for joining 2 to 18 cables, is available with either a natural rubber or a synthetic rubber compound. The crab connector, accommodating 4 to 12 cables, has a natural rubber compound coated with a neoprene dip.

• A centralized control system for unattended power stations and substations provides up to 105 channels

(*Continued on page* 66)

To prevent pole and power line leaning...

guy with

CF&I GALVANIZED STEEL STRAND

Whether it is an installation involving exposure to the corrosive action of acrid industrial fumes or to severe storms—public utility linemen know that CF&I Galvanized Steel Strand will withstand rugged service.

Meticulous adherence to standards characterizes every step in the manufacture of CF&I Galvanized Steel Strand. It meets or exceeds ASTM Specifications A-122 or A-363—or, if you prefer, our Buffalo, N. Y. or Pueblo, Colo. plants will make it to your specifications in seven- or three-wire constructions. When you're in the market for top quality, guy, messenger or overhead ground wire, contact your nearby CF&I representative or your local electrical distributor.

5690

CF&I GALVANIZED STEEL STRAND
THE COLORADO FUEL AND IRON CORPORATION

Albuquerque • Amarillo • Atlanta • Billings • Boise • Boston • Buffalo • Butte • Chicago • Denver Detroit • El Paso • Ft. Worth • Houston • Kansas City • Lincoln (Neb.) • Los Angeles • New Orleans New York • Oakland • Oklahoma City • Philadelphia • Phoenix • Portland • Pueblo • Salt Lake City San Francisco • Seattle • Spokane • Wichita. CF&I OFFICES IN CANADA: Montreal • Toronto

FORGED, of Course!
BTC
Drop-Forged
STRAIN YOKE SETS
Superior resistance to shock and fatigue
Forged plates with full radius (corona free) edge
Specify the best—BTC Hi-Line Hardware
THE BREWER-TITCHENER CORPORATION
HI-LINE HARDWARE DIVISION • CORTLAND, N.Y.

Preview of Products

(*Continued from page* 65)

of control supervision and a maximum of 30 channels of continuous telemetry over one transmission circuit. It is a development of Applied Science Corp of Princeton (ASCOP), Princeton, N. J. The pioneer model was made for an eastern electric utility to centrally control an unattended remote cable oil pumping plant, and provide alarm for off-normal equipment operations and continuous telemetered records of two oil pressures and an oil level.

• A 200-amp socket meter mounting provides a by-pass for the meter when making a change, without interrupting the circuit. This mounting is marketed by Code Equipment Sales Co, Philadelphia, Pa.

Eleven Manufacturers Report 6 Months Earnings

Manufacturers' sales, net earnings, and earnings per common share are reported for the six months ending June 30, 1958 and the corresponding 1957 period, unless otherwise indicated.

Allis-Chalmers Mfg Co. Sales 1958—$269,506,611, for 1957—$285,-831,554; earnings 1958—$8,399,-788, for 1957—$11,048,383; per share 1958—$1.02, for 1957—$1.35.

Combustion Engineering Co. Sales 1958—$164,721,318, for 1957—$105,415,726; earnings 1958—$3,-618,708, for 1957—$3,503,792; per share 1958—$1.12, for 1957—$1.09.

Copperweld Steel Co. Sales 1958—$40,433,967, for 1957—$67,986,-565; loss 1958—$207,138, income 1957—$1,989,981; per share 1958—none, for 1957—$1.76.

Foster Wheeler Corp. Billings 1958—$94,388,797, for 1957—$75,-399,644; earnings 1958—$1,770,-258, for 1957—$1,092,986; per share 1958—$2.98, for 1957—$1.84.

Kaiser Aluminum & Chemical Co. Sales 1958—$198,344,000, for 1957 — $196,646,000; earnings 1958—$11,833,000, for 1957—$15,697,000; per share 1958—$0.66, for 1957—$0.97.

Kennecott Copper Corp. Sales 1958—$132,656,517, for 1957—$162,-433,827; earnings 1958—$22,959,-

071, for 1957—$49,331,408; per share 1958—$2.12; for 1957—$4.56.

Okonite Co. Sales—not reported; earnings 1958—(loss $237,924), for 1957—$16,140; per share 1958—(loss $1.10), for 1957—$0.08.

Square D Co. Sales 1958—$44,821,331, for 1957—$50,696,210; earnings 1958—$2,655,779, for 1957—$4,464,656; per share 1958—$0.51, for 1957—$0.85.

Sylvania Electric Products Inc. Sales 1958 — $147,576,216, for 1957 — $162,520,532; earnings 1958—$2,582,870, for 1957—$4,788,669; per share 1958—$0.67, for 1957—$1.30.

Triangle Conduit & Cable Co. Sales 1958 — $26,333,706, for 1957—$28,084,511; earnings 1958—$1,090,893, for 1957—$1,704,103; per share 1958—$0.80; for 1957—$1.26.

Westinghouse Electric Corp. Sales 1958—$923,961,000, for 1957—$982,939,000; earnings 1958—$29,973,000, for 1957—$30,615,000; per share 1958—$1.70, for 1957—$1.77.

MANUFACTURERS BRIEFS

Combustion Engineering Inc, New York, reports that more than 100 controlled circulation boilers, representing approximately a $500-million investment, have been purchased by the American utility industry. Virginia Electric & Power Co was the first utility company to purchase a unit following Combustion's introduction of this high-pressure design in 1950.

Hubbard & Co executive offices are now in the Borg-Warner Building, 200 South Michigan Ave, Chicago, Ill, having moved August 1 from Pittsburgh, Pa.

Kaiser Aluminum & Chemical Sales Inc, has furnished aluminum sheet for one of the first installations of boiler lagging at a central power generating station. The 140,000 lb of stucco embossed flat and box ribbed sheet covers two 250,000-kw boiler units of "outdoor type" construction at an Ohio Power Co plant at Beverly, Ohio.

SPECIAL ZINC-RICH COATING GIVES GALVANIC PROTECTION TO METALS

Galvanox is a special coating composed of an extremely high percentage of metallic zinc in an organic binder. The resulting film supplies an electro-chemical type of protection long associated with galvanizing. Applied as a paint, it dries and "cures" to form a very dense coating of metallic zinc.

Galvanox comes ready-mixed in a natural zinc color only and has specialized uses and applications, as:

- For replacing galvanizing
- For reconditioning galvanizing
- For covering arc welds and welding
- For use in conjunction with cathodic protection
- For use as an electrical conductor
- For minimizing electrolysis
- For use as a metal filler
- For underwater, underground or high humidity exposures.

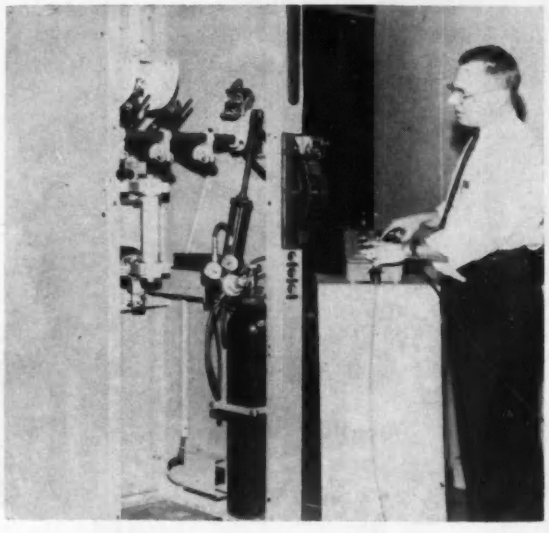
Learn more about the application of Galvanox and its low cost. Write today for a copy of "Galvanox by Subox."

SUBOX PAINTS

Subox Inc.

Established 1924
3 Fairmount Plant
Hackensack, N. J.

New Equipment



Pneumatic Interrupter Control

. . . provides remote or automatic operation of HPL-C metal-enclosed interrupter switches, in ratings of 600 through 2,000 amp and 2.4 through 14.4 kv. Consisting of double-acting air motor, linkages, solenoid valve, and air cylinder, the system permits remote pushbutton control, automatic throwover, and circuit opening on overload with thermal or overload relay sensing. Manual operating handle, used only in emergencies, is removed from operating mechanism and bolted to enclosure. Key interlock prevents accidental manual operation of switch. Air cylinder may be located outside cabinet. Unit requires little maintenance.
R&IE Equipment Div, I-T-E Circuit Breaker Co, Greensburg, Pa.

Disconnect . . .

. . . uses epoxy resin to provide positive bond between metal parts and wet-process porcelain housing. Resin is not subject to shrinkage cracks that would permit water entry

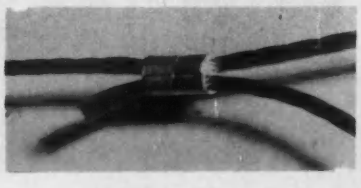
and cause freezing damage. Available in ratings of 200, 400, and 600 amp at 7.8 kv, this unit has double blade of heavy bus-bar copper, and multiple contact points. Switch may be mounted in vertical position or at angle of 20 deg to vertical. Blade is completely dead in full open position, since hinge is electrically isolated. Door can be closed with blade open to prevent weather damage to contacts. Terminals are cadmium-plated to take copper, aluminum, or ACSR conductors. Design assures operation under all conditions.
A. B. Chance Co, Centralia, Mo.

Distribution Transformer

. . . in single-phase, pole-type line are completely redesigned to have improved electrical characteristics, lighter weight, and easier maintenance. New core has every air gap bridged to reduce exciting current. Change in coil proportions provides lower impedance and losses, producing better regulation and improved efficiency. Redesigned bushings are internally clamped and have large tin-plated connectors. Line includes ratings from 3 to 167 kva for voltages of 18 kv and below.
Moloney Electrical Co, St. Louis 20, Mo.

Compression Connectors

. . . permit simple, two-handed installation, either hot or cold. Available in 23 sizes, these KPD and KPO Press-On parallel connectors accommodate No. 6 solid to 4/0 ACSR, aluminum-to-aluminum, or copper-to-copper. Built-in spacer minimizes corrosion in bimetallic joints and prevents cold flow in aluminum-to-aluminum joints. It also prevents conductor damage from strand cutting. Units can be installed in existing hydraulic or mechanical crimping tools standard dies. Made of pure aluminum, they are factory etched and coated and are prefilled with inhibitor. Top of connector wraps run conductor in solid wall of metal to prevent corrosion products from entering along conductor axis.
Penn-Union Electric Corp, Erie, Pa.



Aerial Platform . . .

. . . is more compact and has simplified control system. Operator on platform operates valves of hydraulic system by direct mechanical

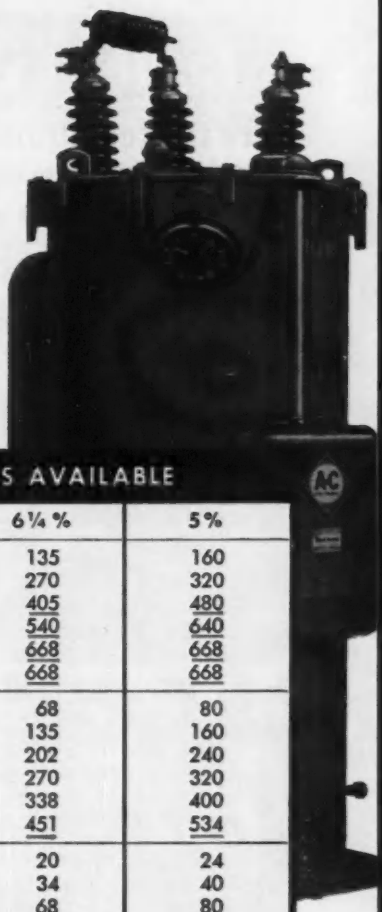
(*Continued on page* 70)

Allis-Chalmers—25 Years of Leadership in 5/8% Regulators

now... *Vari-Amp Ratings*

to 668 Amperes on Allis-Chalmers

distribution voltage regulators



RATING		RANGE AND CURRENT RATINGS AVAILABLE				
VOLTS	KVA	10%	8¾%	7½%	6¼%	5%
2,500	25.0	100	110	120	135	160
	50.0	200	220	240	270	320
	75.0	300	330	360	405	480
	100	400	440	480	540	640
	125	500	550	600	668	668
	167	668	668	668	668	668
5,000	25.0	50	55	60	68	80
	50.0	100	110	120	135	160
	75.0	150	165	180	202	240
	100	200	220	240	270	320
	125	250	275	300	338	400
	167	334	367	401	451	534
7,620	11.4	15	17	18	20	24
	19	25	28	30	34	40
	38.1	50	55	60	68	80
	57.2	75	83	90	102	120
	76.2	100	110	120	135	160
	114.3	150	165	180	203	240
	167	219/241	241/265	263/289	296/326	351/386
	250	328/361	361/397	394/434	443/487	525/578
13,800	34.5	25	28	30	34	40
	69.0	50	55	60	68	80
	138.0	100	110	120	135	160
14,400	36.0	25	28	30	34	40
	72.0	50	55	60	68	80
	144.0	100	110	120	135	160

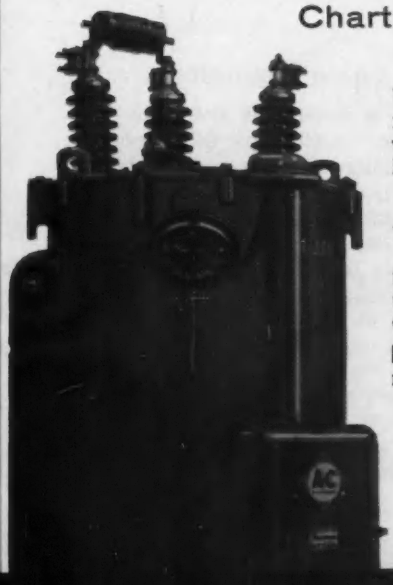


Chart shows ratings to 668 amperes with 21 new *Vari-Amp* ratings

Vari-Amp can now be used to increase regulator capacity (while decreasing range of regulation) to a maximum allowable current of 668 amperes or 160%. This new development results in increased applications for distribution regulators and further lowers the cost of regulation.

You now get as much as 50% increased kva capacity on 21 different ratings of Allis-Chalmers ⅝% step regulators.

These new load-carrying capabilities have been tested in actual field service for four years and many of the new ratings are in stock for immediate shipment. Behind this announcement is the continuous development program that has maintained Allis-Chalmers design and operational leadership during the past 25 years.

For details, contact your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-5751

It's NEW!

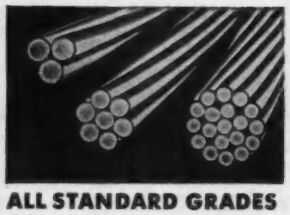
Wire that combines the strength of steel with the high corrosion resistance of aluminum

ACCO It's *Aluminized!*

PAGE STRAND

PAGE has successfully combined two time-tested metals into a revolutionary new wire—ACCO ALUMINIZED—that has a ductile, protective coating of aluminum *bonded* to iron and steel wire by a hot-dip method. This product is covered by and is manufactured under processes covered by U.S. and foreign patents.

Now PAGE offers ACCO ALUMINIZED Steel Strand for guy wire, ground wire and messenger wire applications. Can be used with Preformed Guy-Grip dead-ends made of ACCO ALUMINIZED Wire, or with galvanized pole hardware. Here is evidence of ACCO ALUMINIZED Steel Strand's superiority: salt spray tests conducted in strict accordance with ASTM procedures show that, for equal thickness of coating, aluminized *outlasts galvanized by more than 2 to 1.*



Also... PAGE *Aluminized* ACSR CORE WIRE

Aluminum Conductor Cable with PAGE ACCO ALUMINIZED ACSR Core Wire is now available from many manufacturers of conductor cable. Product quality control is assured by a special testing procedure mutually developed by PAGE and ALCOA.

ALL STANDARD GRADES

PAGE ACCO ALUMINIZED Steel Strand is available in Common, Siemens-Martin, High Strength, Extra High Strength and Utility grades with physical properties meeting ASTM Spec. A-122-54-T and A-363-55-T.

NOTE: We will continue to make and market PAGE Stainless Steel Strand and PAGE Galvanized Strand, as heretofore, in 3-, 7- and 19-wire construction.

Send for Informative Booklet

How about ductility and adherence properties of aluminized wire? Why does aluminizing create a true duplex coating over the core? How does aluminum "sacrifice itself" to provide electrochemical protection? For answers, write us at Monessen, Pa., asking for **Booklet DH537-A.**

ACCO for Better Values

Page Steel and Wire Division
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

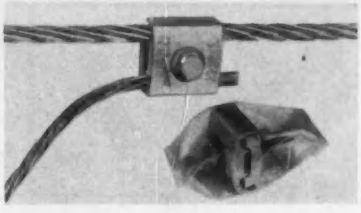
ACCO

Aerial Lift . . .

(*Continued from page* 68)

linkage control system. System provides immediate, positive response and eliminates hydraulic hose in upper boom, simplifying maintenance. Model with 40-ft working height has 1,000-lb capacity; 50-ft model has 500-lb capacity. Unit requires less headroom and less installation space on truck. Unit is powered through power take-off or by separate engine.

Pitman Mfg Co, 300 W 79th Terrace, Kansas City, Mo.



Al Distribution Clamp . . .

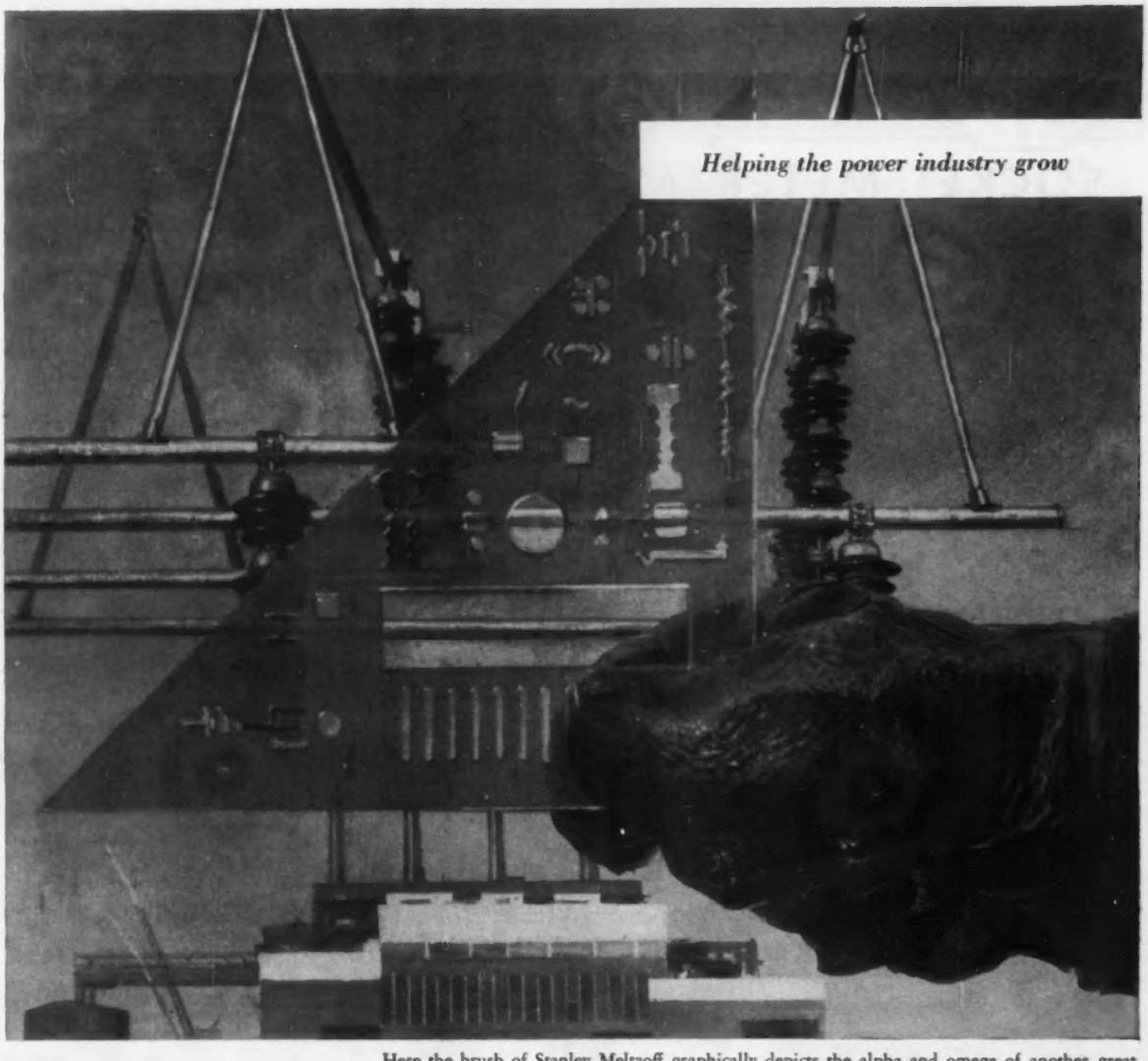
. . . has little galvanic corrosion and can be used for copper-to-aluminum connections without copper liners. It is offered in three sizes to accommodate conductors from No. 6 to 1/0, from No. 2 to 4/0, and from 1/0 to 336.4 Mcm, strand, solid, and ACSR. Conductor range is stamped on each clamp. Unit has single hex-head bolt and all parts are captive. Current carrying parts are extruded aluminum alloy with high electrical and thermal conductivity and high coefficient of linear expansion. Factory-applied inhibitor is optional.

Reliable Electric Co, Franklin Park, Ill.

UG Cable Connector . . .

. . . is waterproof and easily installed. Intended for use in power distribution, and street, tunnel, highway, or airport lighting, it uses plug-in fittings to permit separation for testing and servicing after assembly is completed. Kit includes molded rubber receptacle housing with disposable assembly sleeve; metal receptacle fitting with disposable assembly pin; molded rubber housing for the plug; and a metal

(*Continued on page* 72)



Here the brush of Stanley Meltzoff graphically depicts the alpha and omega of another great power project—the intricate installation nearing completion, the gloved hand of a skilled craftsman grasping the template used by the engineer and draftsman in translating the design.

Control Costs in Construction

Regardless of the size and complexity of a project, cost control is invariably an important factor in its design and construction. Our experienced teams have proved over and over their ability to complete projects on schedule and within established budget limits. We offer a broad, flexible range of services—and facilities that can be adapted to moderate or extensive needs.

We have worked with many well-known utilities and industrial firms in designing and constructing hydroelectric and thermal plants, electric substations, and installations for supplying heating and process steam.

Let the skills and creative abilities of United Engineers augment the engineering staff of your own organization. We invite you to share and profit from our background of more than 70 years' experience.

UNITED ENGINEERS

& Constructors Inc

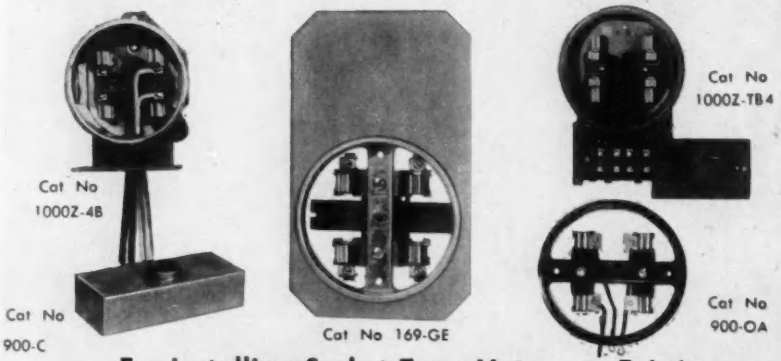
U.E.&C. (Canada) Ltd.

Designers • Constructors • Consulting Engineers

New York • PHILADELPHIA • Chicago

ANCHOR

SOCKET METER ADAPTERS

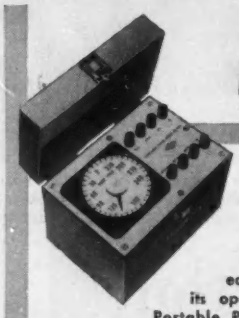


For installing Socket Type Meters on Existing Bottom Connected Equipment.
Many other styles in production.

SEND US YOUR PROBLEMS

ANCHOR MANUFACTURING CO.
MANCHESTER, NEW HAMPSHIRE

PORTABLE PHASE ANGLE METER



Completely self-contained, and requiring no auxiliary equipment for its operation, this Portable Phase Angle Meter offers a direct way of checking relay and instrument connections, particularly directional over-current relays, differential relays or similar equipment. It may also be used to measure the prevailing power factor in each phase of a polyphase watthour meter installation. The device has a frequency of 60 cycle, with voltage ranges of 60, 120 and 240 volt. Current ranges are 1, 2.5 and 5 amp. . . . DIMENSIONS: 9½ x 6¾ x 5⅝ inches. Weight 19 pounds.

Also available in other voltage combinations
Write for Bulletin #75 for complete information

EASTERN SPECIALTY CO.
PHILADELPHIA 40 PA.

NEW WRIGHT Type "C" Pull-A-Ways

FOUR SIZES • ¾, 1½, 3 and 6 Tons

FEATURES
- Lubricated for life
- Hooks are drop-forged
- Special alloy-steel chains
- Chain sheaves of drop-forged alloy steel
- Gear teeth cut to precision limits
- Load brake is dependable and safe
- Weights: ¾-ton, 14 lbs. 1½-ton, 23½ lbs. 3-ton, 36½ lbs. 6-ton, 63 lbs.

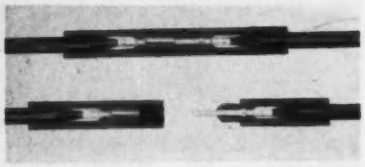
ACCO

Write to York, Pa., office for complete information

Wright Hoist Division
AMERICAN CHAIN & CABLE
York, Pa., Bridgeport, Conn.

UG Cable Connector

(*Continued from page* 70)



plug fitting. Insulating jelly is inserted in all voids in each housing to prevent formation of corona, exclude moisture, and ease attachment of cable.

AGA Div, Elastic Stop Nut Corp of America, Elizabeth, N. J.

Compression L Taps . . .

. . . for use with ⅝-in. crimping dies are available in 15 sizes for connecting all combinations of No. 8 solid copper or aluminum to No. 2 stranded copper, aluminum, or ASCR. Heavy aluminum section connecting run and tap compression barrels keeps dissimilar metals widely separated. Both compression areas are indent marked. Tap barrel is filled with inhibitor and capped with color-coded plastic that may be easily punctured by tap wire. Special inhibitor in run area maintains low resistance contact. Line is designated DCL.

Anderson Electric Corp, P.O. Box 2151, Birmingham 1, Ala.

Tape Transport System . . .

. . . for recording, storing, and reproducing analog or digital data has capstan drives with 2-millisec start-stop times that permit tape to run in either direction at speeds of 7.5 to 60 ips. For special applica-

(*Continued on page* 74)

KELLOGG'S FABRICATING TECHNIQUES KEEP PACE

Fabrication of the Type 316 Stainless main steam piping for Philadelphia Electric Company's new Eddystone Station, Unit No. 1, comes nearer to completion—in The M. W. Kellogg Company's Jersey City shops.

Designed for use at a record 5,000 psi-1200 F., these steam lines required the heaviest wall thicknesses ever used in Type 316 steam-electric plant piping.

To fabricate 2,400 ft. of such heavy-walled stainless piping to exacting specifications is, in itself, a task that few fabricators could be entrusted to undertake. For many years M. W. Kellogg has been testing and evaluating materials, and perfecting fabricating techniques, in conjunction with the foremost power companies and major equipment suppliers. This experience assures today's ultimate in operating efficiency.

Kellogg welcomes the opportunity to discuss its complete power piping design, fabrication, and erection facilities with consulting engineers, engineers of power generating companies, and manufacturers of boilers, turbines, and allied equipment.

Photo above, of section of Type 316 piping being welded, dramatically shows ratio of wall thickness to inside diameter. This section has already been bent, in rear, to a 90° angle. Below, welded joints of smaller section of Type 316 being ground to dimensions. The bend on this section is visible at left.

Fabricated Products Sales Division

THE M. W. KELLOGG COMPANY, 711 THIRD AVENUE, NEW YORK 17

A SUBSIDIARY OF PULLMAN INCORPORATED

The Canadian Kellogg Co., Ltd., Toronto • Kellogg International Corp., London • Kellogg Pan American Corp., New York • Societe Kellogg, Paris • Companhia Kellogg Brasileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas

POWER PIPING—THE VITAL LINK

Tape Transport System

(*Continued on page* 72)

tions, high speed of 150 ips is also available. This fully transistorized equipment takes tape widths from 0.25 to 2 in., and has storage bins for 3,000 in. of tape. Known as the Model 424, it has modular construction and a moderate power dissipation.

D. G. C. Hare Co, New Canaan, Conn.

Cable Couplers . . .

. . . for portable cables rated up to 7.5 kv provide safe, convenient means of connecting mining equipment, electric shovels, portable substations, or junction boxes. They may also be used for joining lengths of high voltage cable. Rated 300-amp, grounded neutral, each coupler comprises a plug and socket, each with three contacts for conducting power, and one for shielding or grounding wires. Contacts are mounted in and protected by one-piece, heavy duty pressure molded insulators. Ground check circuit contacts can be provided for systems using ground continuity circuit checks.

PLM Products, Inc, 3871 W. 150th St, Cleveland 11, Ohio

More New Products

Top-mounted **hoist** capable of handling 500-lb, lifts low voltage power circuit breakers into, and out of, low voltage switchgear cubicles where ceiling-mounted hoists are not useable. It is mounted on dual channel track bolted to top of switchgear lineup.—Allis Chalmers Manufacturing co, Milwaukee 1, Wis.

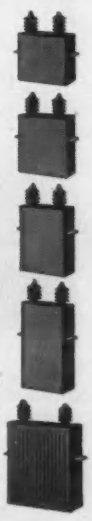
Digital data recorder transcriber measures temperature, pressure, strain and other process variables, converting electrical signals to digits on magnetic tape at rate of 10,000 samples per sec. Pre-determined portions can be selected and rearranged in block form for processing in computer.—Minneapolis-Honeywell Regulator Co, Minneapolis 8, Minn.

99.6% SURE

Of all manufacturers of power capacitors only C-D puts each and every unit through a full voltage energization test before shipment to you. This is why C-D delivers an unbeatable 99.6%-sure performance

PERFORMANCE

in the field.



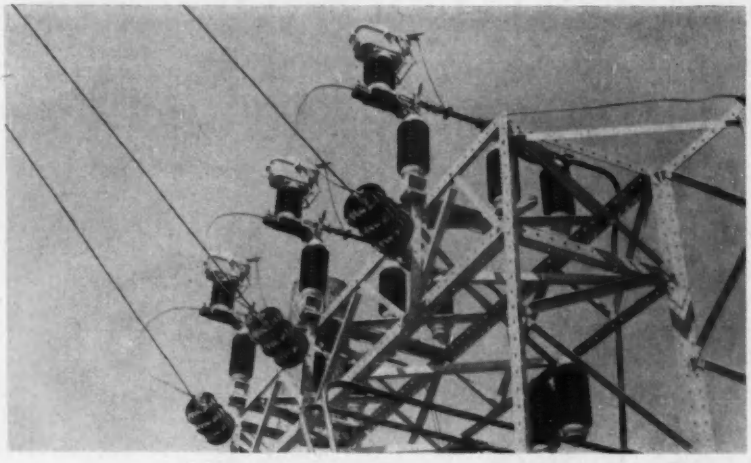
15, 25, 33.3, 50 and 100 KVAR capacitors for every application with lowest dielectric unit stress and highest major insulation level. Invest your purchasing dollar in internal quality—the only place where it counts. See your C-D representative or write Cornell-Dubilier Electric Corp., Dept. EW-8, South Plainfield, N. J.

SPECIFY

Consistently *Dependable*

CORNELL-DUBILIER

POWER-FACTOR CAPACITORS



Air Break Switches with oil interrupter units . . .

Interrupt Loads Economically

ALOYSIUS J. HOELZ, Plant Engineer, Hevi-Duty Electric Co, Watertown, Wisconsin

Economical high voltage switching at Hevi-Duty Electric Co's Watertown, Wis substation is provided by Line Material air break switches equipped with oil interrupter units. These units provide plant personnel with a safe reliable means of de-energizing the substation, which has one 500-kva transformer and provision for a second. It converts the 27.5-kv utility supply to 2.4/4.16 kv for distribution to individual buildings.

Oil interrupters were selected because they could meet all high voltage switching requirements at a reasonable cost. Normal load currents, both present and future, and magnetizing currents are easily interrupted. Addition of the interrupters does not change electrical clearances, phase spacings, or performance under icing conditions. Routine maintenance is simple—an oil change and general inspection of internal contacts after five years service or 500 operations.

Switching versatility of the oil interrupters has important advantages to both the utility and the customer. Utility trips to switch the high voltage side of the substation are fewer. If a high voltage fuse blows during production hours, it can be replaced by plant maintenance personnel and production resumed in a matter of minutes. Plant or fire-fighting personnel can de-energize the substation immediately in an emergency. During plant shutdowns, routine maintenance on substation equipment can be performed at the convenience of plant maintenance men.

Infra-Red Speeds Drying

R. O. SMITH, Industrial Sales Engineer, The Connecticut Light & Power Co, Meriden, Conn.

Production volume has been stepped up, product quality improved and safety further assured with the installation of an infra-red oven with high intensity quartz lamps to bake paint on license plates at the Connecticut Reformatory, Cheshire, Conn. Metal plates are now processed in a 78-kw percentage time controlled conveyorized oven which replaced four batch-type ovens. The new installation requires less floor space, reduces finishing costs and is considerably cleaner and safer.

A ½-hp mono-rail conveyor can carry the plates in and out of the ventilated oven at the rate of 2,000 pairs in six hours—or two minutes per pair. The result is a better bake than the old, convection method.

Versatility is an added advantage. The new installation is also used for degreasing, replacing an unsuitable chemical method. The oven may be run on high heat of 700F for thermal degreasing. Heats of 300F for prime coats and 250F for top coats are available through the use of an interval timer. Changes are made almost instantaneously with no warm-up time.

(*More Selling on page* 78)

Tension Stringing with **PENGO** Equipment

- ***Saves costly manhours in lagging.***
- ***Reduces number of set-ups (can string 2 or 3 reels per phase from a single set-up).***
- ***Safest, most economical way of stringing transmission, distribution and even secondary lines.***
- ***Its greatest savings are effected when stringing over and through energized circuits . . . by far the safest, too!***

Smooth, positive control of conductor tension can be maintained at all times regardless of model or size of PENGO tensioning equipment used. The large, specially designed PENGO disc brakes are mounted away from the Bullwheels to assure dissipation of the heat generated by the continuous braking action and prevent transmission of the heat to the Bullwheels.

PENGO pulling and tensioning equipment is designed and built by an organization with years of actual line construction experience and a thorough knowledge of stringing problems and requirements. PENGO Tension-Stringing equipment has been thoroughly proven in world-wide use, under the widest range of conditions.

PENGO offers more than 40 models of Tension-Stringing equipment to meet any requirement as to conductor sizes, terrain, and stringing conditions.

795,000 cm ACSR is paid out under controlled tension on this new 33 mile 230 KV H-frame transmission line for the Arizona Public Service Co. PENGO 6100-54" Reel Carrier, which loads reels up to 10,000# under power in less than 60 seconds, handles the conductor reels. Continuous braking action is provided by PENGO 6000-TR-II-A6 Tensioner with Neoprene-lined bullwheels which accommodate all conductors up to 1.39" diameter.

PENGO 6700-I-BWCP-TR located approximately 15,000' down right of way is pulling in the wire rope pulling line at speeds up to 352 feet per minute. Companion unit, PENGO 6100-TCRW-54" Reel Winder receives pulling line under reduced tension and winds it onto power driven reel. Speed of operation and long pull, reducing number of setups considerably, is key to successful, economical operation in tension stringing.

List your requirements and send for descriptive literature and prices.

PETERSEN
ENGINEERING CO., INC.
Santa Clara, California

B-3

PETERSEN ENGINEERING CO., INC.
Santa Clara, Calif. Dept. G8
Please send PENGO Tension-Stringing equipment data to:

NAME:_____

FIRM:_____

ADDRESS:_____

CITY_____ STATE_____

'Supermarket' Ad Sells Kwhrs to Female Mind

How do you sell electricity to women, when it doesn't come packaged, bottled or bagged? When it can't be eaten, worn or smoked? And also show it costs so little for what it does for them?

Wisconsin Power & Light Co's Public Information Director W. S. Johnson, with the help of Reddy Kilowatt, has come up with an answer that is making a stir in utility sales circles. Beginning with what he calls "the relationship of food to the strongest of instincts, self preservation," ad man Johnson looked around for a way to tie it to electricity, and then put both in a format women (who buy so much of everything, including kwhrs) would read. The result: A "Supermarket" ad (see below) listing food and household items, and the corresponding electricity costs for cooking, freezing, and using them. The 1,000-line ad appeared on Thursdays, with regular supermarket ads, on the food page.

Headline stresses values 'today and everyday.' Women, often more value-conscious than men, will be attracted to ad by this.

Note that cost-of-electricity story is plugged immediately under the 'Supermarket' slug.

Reader's eye goes first to name of item, then to what appears unbelievably low price. Copy stresses perfection and ease of electric cooking.

Ad is seasonal. A summer food item head allows copy to push electric freezer story, immediately below the cooking copy.

Roll copy stresses both electric baking and freezing. Deepfryer, range, and toaster are brought to reader's mind right here.

Note signature slug again identifies electricity by using Reddy Kilowatt

BIG VALUES
Today and Every Day
AT REDDY KILOWATT'S
Best-Buy Super Market
Cost of electricity for food preparation, food preservation and household service
PICNIC SPECIALS
Whole Picnic HAMS
— baked to perfection in your automatic electric roaster, ready to take with you to the picnic for only 4¢
Spring Fryers
Juicy, tender, french fried to a golden brown in a deep fryer at a cost for electricity of only 3¢
Pork and Beans
Beef Roast — the finest you've ever tasted. Done to a turn with shrinkage reduced to a minimum in your electric oven for only 6¢
Roast Turkey — kept cold for a whole day along with everything else in your refrigerator for about 2¢
YOUR OWN MIX Golden Pancakes
Light fluffy pancakes that will make your mouth water—24 baked on your electric grill for only 1¢
A Summer Suggestion
5¢
Bakery Treats
Luscious Flavor at Low, Low Prices
Home-Made Rolls Bake 'em when the weather is cool — freeze them — store in your big 16 cubic foot home freezer along with dozens of other items for a daily cost of electricity of only 5¢
Doughnuts — 8 dozen done to perfection in your electric deep fryer for only 1¢
Cookies — for the lunchbox, 6 dozen baked in the oven of your electric range for only 2¢
Toast —to your taste—14 golden slices from your automatic electric toaster 1¢
Fluffy Cakes whipped in your electric mixer at a cost for electricity of less than 1¢
Cleaning Specials
Brooms 1¢
Floor Wax 2¢
Soap 1¢
Plastic Clothes Pins 12¢ per load
Washboard 1¢ per load
Decorative Candles 4¢
Paper Bags 2¢
Lamp Bulbs 2¢
COFFEE SPECIAL
43 cups of the most delicious coffee you have ever tasted brewed automatically in your electric coffeemaker for only 1¢
GARDEN FRESH
Fruits and Vegetables
Oranges —juicy, thin-skinned. Your electric juicer will squeeze all the juice your family will use during the month at a cost for electricity of less than 1¢
Bushels of Fresh Fruits, Peas, Beans, Tomatoes — June-fresh in January stored in your electric freezer along with dozens of other items at a cost for electricity per day of only 5¢
Lettuce —kept crisp and fresh in the crisper drawer of your refrigerator for days and days for only 1¢
Fresh Fish — quick-frozen "the big one that didn't get away" and stored in your freezer for months for only 3¢
Fresh Wisconsin Dairy Butter — kept "just right for spreading" in the special "butter-keeper" in your refrigerator at a cost for electricity so small that it would take days to use up 1¢
Ice Cream — and other frozen desserts made in the freezing unit of your refrigerator . . . the cost for electricity — less than 1¢
Beauty Aid
Hot Water
plenty of it for your shaves and all of the other household requirements in an average home, heated electrically for only 12¢ per day
Open 24 hours a day — Shop in Cool Comfort
Reddy Kilowatt's Best Buy Super Market
WISCONSIN POWER AND LIGHT COMPANY

Reddy Kilowatt establishes electric identity right at top of ad. This is important to catch attention of reader who might pass by without realizing ad's message.

Copy talks about brewing coffee, rather than drinking it. This is usually a women's job, has more appeal to her than to a man, who thinks about drinking it.

Labor-saving features of electric housewares are pegged to housewife. Implication is that she needn't work for a month for only a penny.

Savings are pushed again in reminding women how electricity can help her save time and money on her household chores.

Nothing appeals to women more than 'beauty' talk. Copy here ties electricity to woman's appearance in a way she has no trouble understanding, and does not fear.

this man is changing taps *faster . . . safer . . . more economically!*

Take a good look at this lineman. He's changing taps alright, but his hand's *not* inside the tank, exposing the oil to contamination. And if you look closely, you'll note the absence of a hand-hole cover, thus decreasing the danger of tank breathing.

Take a good look. Note how low on the pole he is, well out of danger, and the taps will be changed in no time at all. All he has to do is remove and reverse the cap, then use it as a handle to make the setting. This saves time, which saves his employer money.

Finally, since his hand's not down inside the tank, this lineman can see what he's doing, so there'll never be any question in his mind about the tap setting!

This man is changing taps the thoroughly tested and proven RT & E way, with the industry-famous RT & E Externally Operated Tap Changer. Costly, time-wasting, and dangerous steps in changing taps have been completely eliminated.

Ask your RT & E representative to demonstrate this Tap Changer. Or write for further specifications.

ENGINEERING TALENT CONCENTRATED ON ONE IDEA — A BETTER TRANSFORMER

RT&E CORPORATION

WAUKESHA, WISCONSIN • PORTLAND, OREGON

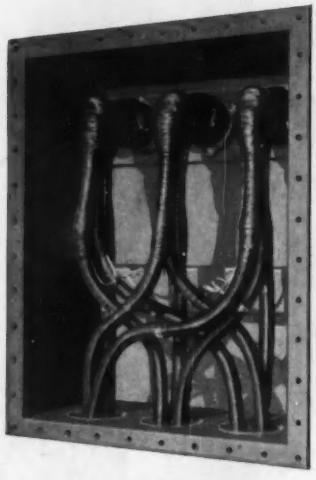
750 MCM Single Conductor 91 Strands, 5KV Shielded SUPER-PARARITE PARAPRENE CABLE.

PARANITE®

SUPER-PARARITE® PARAPRENE® CABLE

Installed at Turkey Creek

Here's another example of power—Paranite—and American industry . . . the selection of Super-Pararite Paraprene Cable for the new Turkey Creek Pumping Station at Kansas City, Missouri. The Super-Pararite butyl conductor insulation is recognized for superior resistance to heat, cold, moisture, oxidation and ozone, while the Paraprene neoprene jacket possesses inherent resistance to sunlight, abrasion, ozone, heat, oil and chemicals . . . one of many Paranite products which has earned the industry reputation—"IF IT'S PARANITE IT'S RIGHT."®

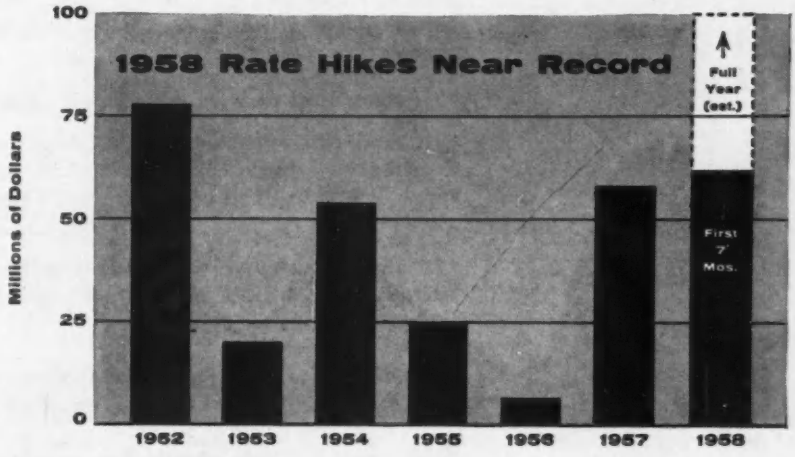


PARANITE WIRE AND CABLE DIVISION

Essex Wire Corporation, Fort Wayne 6, Indiana

MANUFACTURING PLANTS: Birmingham, Ala.; Anaheim, Calif.; Jonesboro, Ind.; Marion, Ind.; Tiffin, Ohio

Sales Offices in all Principal Cities



Report on
Rates and Regulation

21 Utilities Get Hikes; 2 Denied

First half of '58 saw a record $55 million annually in rate hikes granted to the power companies, and the pace showed no signs of slackening as the second half began. Commissions awarded another $13 million in annual rate increases during July. In seven months, this year's total has already topped each of the full years 1953, '54, '55, '56, and '57; and now needs but $9 million more to rise above 1952—the biggest year since records have been kept.

By the end of the year, the total is likely to reach $100 million. Sixteen applications, aggregating more than $53 million a year, are now pending before regulatory bodies.

Inflation is responsible for these hikes, of course. Many utilities with long records of nothing but rate reductions have turned to the commissions for increases, as labor and materials prices keep going up. The commissions and courts have recognized this by granting relief to 21 companies this year, while only two decisions—one by a commission and one by a court—have turned the petitioning company away empty handed. North Dakota's Public Service Commission turned down a petition by Montana-Dakota Utilities Co (EW, Feb. 24, 1958, p 99), and Narragansett Electric Co lost a court appeal.

The Rhode Island Supreme Court denied Narragansett Electric Co's appeal of an adverse ruling by the state's Public Utility Administrator on a rate increase which was first submitted in 1956. In order to understand the significance of this decision by the court, it is necessary to review some of the background that led up to Narrangansett's appeal.

The company filed in 1956 with the Public Utility Administrator of the State of Rhode Island a petition for a $2.6 million annual rate increase on the grounds that it was earning a return of only 4.6% on a net original cost rate base from its business inside the state.

This was the first rate increase in 37 years, and (as the court admitted in its opinion) substantial rate reductions had been made during this period. More

important, the prices of materials, supplies, and labor entering into utility operations have risen threefold.

The Administrator denied the company's petition in its entirety, and Narragansett took its case to the Rhode Island Supreme Court. The company made 13 contentions in which the administrator erred. The three most important ones are:

- **He disregarded the need to find a fair value rate base under state statute.**
- **He accepted a separation, different from the one used** by the Federal Power Commission, between inter-state and intra-state operations, which made it appear that the portion of the company's business carried on within the state was earning a fair return, and that therefore no rate increase was needed.
- **He accepted an upward adjustment of the book depreciation reserve** which was arbitrary and capricious and contrary to previous findings of the Rhode Island Division of Public Utilities.

The court denied all three major contentions of the company. Its decision appears arbitrary, resting on findings completely irrelevant and totally immaterial.

With respect to Rhode Island's "fair value" statutes, the court implied that the Administrator had only to find that original cost depreciated *was* fair value to get under the "legal ropes." As its legal precedent, the court quoted the Hope Natural Gas case, and its doctrine that it is the "end result" that counts and not the method a commission employed to arrive at its decision. In the Hope case, the majority held that: "If the total effect of the rate order cannot be said to be unjust and unreasonable, judicial inquiry under the act is at an end."

The irrelevance of this doctrine to the case before the Rhode Island Supreme Court can best be judged by the fact that the Hope case was one in a federal jurisdiction, affecting a natural gas pipeline company in interstate commerce, and decided on the basis of economic conditions as they existed in 1939. Also, the court made no mention of the fact that the FPC allowed the Hope Company a rate of return of 6.5%, a reserve requirement well below Hope's book reserve, and in addition gave the company work in progress as part of the rate base.

The Rhode Island Court said it was concerned only with its own rulings ". . . unless they are holdings of the United States Supreme Court." It then went on to quote five regulatory rulings that had nothing to do with the U. S. Supreme Court and were entirely outside the Rhode Island jurisdiction.

At the same time, the court failed to mention the recent decisions by the Supreme Courts of Iowa, Illinois, Missouri, and Montana—all sustaining fair value—or the act of the Minnesota Legislature, which passed a fair value rate base law. Not only were these acts of other jurisdictions carefully ignored, but the Supreme Court appeared to be unaware that there had been any inflation, since no constructive mention of it was made in its opinion.

Concerning the separation of property between inter- and intra-state operations, the company had divided it originally for purposes of supporting interstate sales before the FPC. In this case, the separation was substantially the same. It was made by an administrative engineer of the company who, as the court admitted, ". . . had extensive engineering experience in the problems of generating and transmitting electric energy."

The Administrator, however, accepted the method of his own witness, and a completely disproportionate amount was allocated to interstate service. He showed by "accounting adjustments" that the inter-state operations were conducted at a loss, and that in effect a negative return was being earned on them. This is known as the "predetermined return" method, whereby a company—

These Rate Increases Have Been Granted in 1958 . . .

	Asked For	Granted
Adams Electric	$.....	$16,500
Baltimore Gas & Electric	.....	6,039,000
Boston Edison	2,488,000	2,288,000
California Electric Power	2,008,543	2,032,000
Commonwealth Edison	26,400,000	26,400,000
Consolidated Edison	6,742,000	6,742,000
Dayton Power & Light	41,000	28,500
Empire District Electric	.....	600,000
Housatonic Public Service	714,000	580,000
Iowa-Illinois G & E (Iowa)	.....	910,000
Kentucky Utilities	2,500,000	2,778,000
Long Island Lighting	.....	1,923,000
Montana Power	3,800,000	3,200,000
New York State Electric & Gas	4,200,000	4,200,000
Plymouth County Electric	251,500	251,500
Rochester Gas & Electric	2,500,000	2,500,000
Southern Nevada Power	1,060,000	766,000
Tampa Electric	3,143,000	1,620,000
Wisconsin Electric Power	5,900,000	3,816,000
Wisconsin Power & Light	.....	13,500
Worcester County Electric	1,300,000	1,300,000
TOTAL		$68,004,000

These Have Been Denied . . .

	Asked For	Granted
Montana-Dakota Utilities (North Dakota)	$689,000	.....
Narragansett Electric	2,600,000	.....

And These Are Still Pending . . .

	Asked For
Bangor Hydro-Electric	$460,000
Black Hills Power & Light (Wyoming)	.....
Cincinnati Gas & Electric	2,800,000
Cleveland Electric Illuminating	5,500,000
Consolidated Edison	8,200,000
Consumers Power	12,750,000
Illinois Power	4,344,000
Iowa-Illinois G&E (Illinois)	500,000
Quincy Electric	172,000
Newport Electric	183,000
Niagara Mohawk Power	10,452,000
Northern Berkshire Electric	219,000
Otter Tail Power	350,000
Public Service of New Hampshire	664,500
San Diego Gas & Electric	6,750,000
Southern Berkshire P & E	156,600
TOTAL	$53,501,100

especially one in interstate service with an obviously deficient return—is allocated into a state of financial health.

In sustaining this "accounting adjustment," the court remarked that the credibility of witnesses is important in any regulatory decision. It went on to say that the Administrator was obviously right in relying on his witness, since the

company's witness had ". . . no previous experience in testifying as an expert. . ." Presumably, under this rather intriguing concept of justice, all doctors who have not testified in court in an accident case must be immediately enjoined from further practice as they obviously know nothing about medicine!

The Administrator adjusted the depreciation reserve upward by some 25% on the grounds that it was deficient, in spite of the fact that it had been under continuous review by the Rhode Island Division of Public Utilities. At the same time, he found that the company could accrue annually to extinguish the remaining life represented by the difference between book depreciation and original cost. It is thus admitted that the same property that is used and useful for depreciation expense purposes is not used and useful as rate base.

The court sustained the Administrator with these words: "It must not be lost sight of that the Administrator was here concerned with what was not annual depreciation, but accrued depreciation, a capital deduction which recognizes the depreciation of plant and property that has *already taken place*." Presumably the book reserve sanctioned by the DPU did no such thing.

The court noted that the Pennsylvania Commission in rate cases makes adjustment to the depreciation reserve of the same kind. However, the court did not mention that Pennsylvania, being a fair value state, makes such an adjustment in order to arrive at a just net original cost—one of the evidences of value used by the Pennsylvania Commission in arriving at the fair value rate base.

In the Narragansett case, the Administrator made no fair value finding, but only found an abbreviated original cost rate base—abbreviated because a higher "judgment" depreciation reserve was used rather than the lower book reserve which has been under constant surveillance by the Rhode Island DPU.

The company now has several avenues open for its future plans. It still has about two months to decide whether or not it desires to file a further appeal to the U. S. Supreme Court. The company also can, of course, start over and file a new rate increase petition with the Rhode Island Administrator. A third possibility is that the company may file an application with the FPC with regard to its interstate business. This course could be followed concurrently with either of the other two. As EW went to press, however, Narragansett had not reached a definite decision as to its next move.

If a new rate increase petition is filed by the company, it seems likely that it will be for more than $2.6 million. The test year for purposes of the denied application was 1956, and since then Narragansett's operations have expanded and the company has absorbed two years of rising costs.

In other recent regulatory action . . .

Montana Power Co was granted a $3.2 million annual rate increase by the Montana Public Service Commission. The commission granted an end-of-1958 fair value rate base, and allowed a 5.33% rate of return.

Carolina Power & Light Co was ordered August 1 to raise the base price of its fuel adjustment clause from $6 to $7 a ton. The North Carolina State Utilities Commission acted after a complaint from 38 manufacturing firms, which wanted the fuel clause thrown out entirely. Although this was not done, the change in base price is expected to reduce CP&L's industrial revenue by about $366,000 a year. A spokesman for the utility said the order might be appealed.

The Massachusetts Senate killed late in July a bill to set up a "Consumers' Council" in the state's Department of Public Utilities. The council's avowed purpose was to represent popular interest in rate regulations and allied matters.

Madison G&E Makes Top Executive Promotions

Theron A. Brown has been elected president and general manager, Madison Gas & Electric Co, and William A. McNamara has joined the utility as vp-finance.

The new chief executive, an electrical engineer, graduated from the University of Wisconsin.

In his long years of association with the utility industry he has applied himself in the areas of engineering, construction, operation, and supervision. He is a member of AIEE and Eta Kappa Nu engineering fraternity.

McNamara is a graduate of University of Wisconsin Law School, and a member of American and Wisconsin Bar Association.

BROWN

McNAMARA

Hatch, Wilson, Advance at Alabama Power

HATCH

WILSON

E. I. Hatch has been elected executive vice president and member of the board, and E. A. Wilson has been made a vice president, at Alabama Power Co.

Hatch is a graduate of University of the South and University of Alabama Law School.

Before joining the utility in 1955 he had been a partner of Martin, Blakley & Hatch, Montgomery law firm. With Alabama Power he has had responsibility in rate and tax matters. Hatch replaces E. C. Easter, who retired last month.

Wilson began his career with the company in 1917 as a member of a surveying party. He advanced to draftsman, power sales engineer, senior industrial power engineer, manager of industrial power division, and in 1954 to general sales manager.

Bowen: New Georgia Power Vp

Henry L. Bowen, manager of Georgia Power Co's industrial relations department, has been made a vice president of the company.

Bowen first began working for the company while a student at Georgia Tech. After his graduation as an electrical engineer in 1930, he began full time work as a mechanic and electrician for the utility. He went on to become field engineer in charge of underground construction, district superintendent, and assistant Augusta division superintendent.

In 1946 he went to Atlanta as assistant manager of the industrial relations department, and became manager in 1950.

He is chairman, personnel administrative section, Southeastern Electric Exchange, and member, Industrial Relations Committee, EEI.

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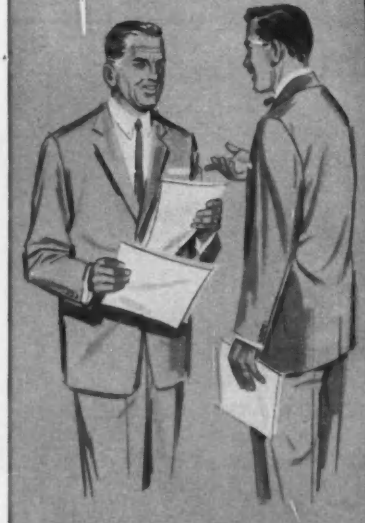

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PERSONAL BRIEFS

At Missouri Power & Light Co, new district superintendent for Excelsior Springs is **Roy Cramer.** He takes the place of **J. T. Lynn,** recently resigned.

Moriss M. Yost has been elevated to Bluefield station supervisor, Appalachian Power Co, with responsibility for operation and maintenance of 121 power plants in the Bluefield district.

Union Electric Co has announced that **Morris B. Mathis,** former employment manager, has been given the new title assistant director of employee relations.

John W. O'Nan has been appointed to the newly created position of executive assistant to the president and chairman of the board, Duquesne Light Co.

Kentucky Rural Electric Co-operative Corp has appointed **Addison F. McGhee, Jr,** director of public relations and personnel.

George W. Unangst has been made district superintendent of Appalachian Power Co's Charleston district, succeeding **J. F. Melton,** who has accepted a position with the American & Foreign Power Co in Brazil.

L. V. Milton has been named district manager of Potomac-Edison Co's Hagerstown district, stepping into the position held by **Robert E. Miller,** who is on extended sick leave.

Burdette A. Johnson has been elected treasurer of the New England Gas & Electric Association succeeding **H. Coleman Moore, Jr,** resigned. **John MacLachlan** steps into Johnson's former position as comptroller.

New plant superintendent of the Topeka steam plant, Kansas Power & Light Co, is **Juel Gerboth.**

Montana Power Co has promoted **David C. Johns** to Missoula division superintendent of electric, gas and water operations.

Ray O. Conwell has been promoted to manager of the fuel supply department, Georgia Power Co. Also at Georgia Power, **W. G. Parmenter** has been made supervisor of substations.

Neil W. Plath has re-joined Sierra Pacific Power Co as assistant general superintendent.

Harold Johnson has been named Hiawatha division superintendent by Kansas Power & Light Co. New superintendent of the Tecumseh generating station for the utility is **H. N. Williams.**

R. T. (Ted) Payne steps into the new position of assistant manager of power generation for Monongahela Power Co. Replacing him as manager of the Riversville station is **Jim Wilt.**

Elected president of the North Central Electric Association; **Robert H. Engels,** vice president of Northern States Power Co.

Vance Seamans has been promoted to south district superintendent of the western division operating department, Oklahoma Gas & Electric Co.

Ohio Power Co has appointed **Edward A. Higgins** manager of the Portsmouth district. Replacing him as East Liverpool district manager is **William A. Black, Jr.** New manager of Bellaire district is **Dominic P. Boffo; John R. Larew** takes over his position as personnel manager of the utility's eastern division.

Recently created position of director of commercial activities, Seattle City Light, has been filled by **A. Clifford Tyler. Charles T. Benson** has been named director of finance for the utility, while **Henry M. Lees** has been appointed resident engineer of the Skagit hydroelectric project, succeeding **Robert E. Brown,** who resigned to become resident engineer of the Karadj dam in Iran.

New executive assistant of the New England Electric System is **Richard J. Lyman,** formerly personnel director, Worcester County Electric Co.

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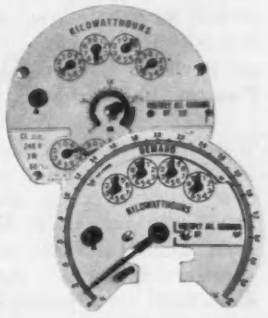

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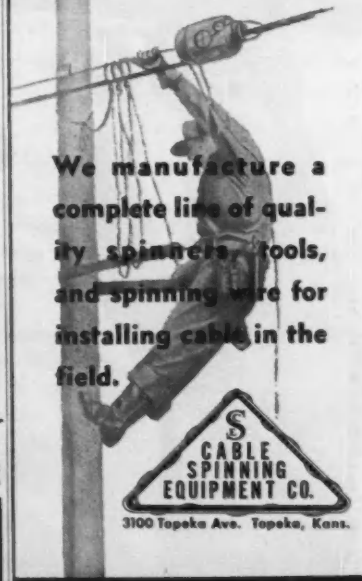

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Robert R. Curtius has been named Ripon district manager by Wisconsin Power & Light Co, succeeding **Dana W. Billings,** retired.

Washington Water Power Co has appointed **W. J. Satre** to the new post of construction and maintenance manager. **G. R. George** has been named assistant manager of construction and maintenance, **R. C. Kelly** has advanced to contract construction and maintenance superintendent, and **Kenneth D. McCord** has been elevated to supervisor of information.

At General Electric Co, **A. A. Watson** has been named manager of marketing, assemblies and components sales of GE's distribution assemblies department, and **R. C. Wilson** has been appointed manager of manufacturing and plant operations for the same department. Also at GE, **Irving H. Ratnour** has been made manager of rectifier customer service, Semiconductor Products department.

W. C. Knoeppel, vice president of the Torrington Division, American Brass Co, will retire September 1 after 47 years of company service . . . New manager of the Anaconda Aluminum Co reduction works at Columbia Falls, Mont. is **James F. Smith.**

B. C. Electric Co has appointed **Harold J. Merilees** to the position of executive assistant.

Dr Mervin J. Kelly, president of Bell Telephone Labs, will be the 1959 recipient of the John Fritz Medal, sponsored jointly by four major engineering societies. The award will be made by AIEE.

Electric Machinery Manufacturing Co has named **Robert Reiss** as manager of its Milwaukee office.

Lester Ulm, Jr, has been made general engineer of Tampa Electric Co. The new head of the company's distribution engineering section is **Alex B. Hull, Jr.**

Two new vice presidents of IBM Corp are **McLain B. Smith,** former manager of the data processing division, and **James W. Birkenstock,** former director of commercial development.

Infilco Inc has elected **W. M. Gross** vice president. He will continue to make his office in New York.

R. E. Carson has joined Kierulff Sound Corp as general sales manager. **Morris M. Mueller** has been appointed merchandise controller, and **Jack Cooper** has been made advertising and sales promotion manager.

High Voltage Engineering Corp has appointed **James H. Bly** as assistant sales manager.

Moffett Engineering Inc announces the election of **Will C. Hall** to president.

John A. Eithel has been appointed to the newly created position, advertising manager, for Pittsburgh Standard Conduit Co.

Recently promoted to manager of engineering administration, Government & Industrial Division, Philco Corp, was **William M. Gourley.**

Reynolds Metals Co has made **William B. Bernstrom** manager of the appliance and equipment market.

Robert E. King is the new distribution equipment sales manager, Square D Co.

Mark W. Cresap, Jr, president, Westinghouse Electric Corp, has received the Westinghouse Order of Merit for distinguished service. **J. F. Kempf** has been made general sales manager of the company's lamp division. **R. W. Brown** has been advanced to manager, **R. E. Bish** has been made engineering section manager, and **J. Q. A. McGuire** has been appointed manufacturing manager in the company's fuel products section.

John I. Yellott, formerly with Stanford Research Institute, announces the formation of John Yellott Associates, mechanical engineering consulting firm.

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Kees Socket Cincher saves time and tempers by simplifying socket meter installations . . . eliminates pounding and danger of breakage to glass covers. May be used on round or square bases.

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Utilities Oppose FCC Plan For Radio Frequency Change

The National Committee for Utilities Radio has informed the Federal Communications Commission of its opposition to proposals in FCC Docket 12404, which would affect availability of frequencies in the 2110-2250 mc band to the Power Radio Service. The action developed at the committee's June meeting in Boston.

NCUR told the Commission that some 97 microwave users now operate a total of 1,498 transmitters, exclusive of standby and emergency equipment in the Power Radio Service. Since the proposed FCC change affects the availability of frequencies, NCUR stands opposed to its adoption.

NCUR will issue a manual to its regional frequency coordinators to guide them in answering request for frequency recommendations from the split channels now available under recent changes in FCC rules.

Similarly, a letter has gone to regional chairmen and frequency coordinators to help them answer requests for frequency recommendations from organizations eligible in the new Local Government Service.

Officers of NCUR for the next year, elected at Boston are Chairman John C. Slothower, Northern States Power Co; Vice Chairman Wesley C. Baylis, Niagara Mohawk Power Corp; and Secretary Harold Backen, Douglas Electric Cooperative, Inc. Roseburg, Ore.

Inventory Help Sought on Outdated Equipment

An inventory of outdated electrical equipment is under way by the Electrical Historical Foundation. It is tabulating all equipment on display, in storage or still in use throughout the U.S. and in Canada. Museums, utilities, educational institutions, and manufacturers are among the organizations from whom information is being solicited.

Information on any old equipment, "the older, the better," may be addressed to the foundation, Box 93, Newfane, Vermont.

About the worst mess we ever got into happened a while ago, when an alarming number of our photoelectric street lighting controls began failing in the field. (Failing *off*, yet!) Needless to say, we kept hopping until we got to the bottom of the trouble.

The failures, for the most part, were finally traced to an elusive defect in one component. A "bad batch" of them had apparently gotten into the controls made in a certain period, causing them to fail left and right. Once *that* was discovered, this component was replaced in a hurry. In the process, we also revamped our own inspection and testing methods, and straightened out a few other homegrown problems as well. The odds are now pretty long against such wholesale trouble ever happening again.

Our customers concerned got a full report of what was going on and what we were doing about it. They were asked to ship back to us all the controls and stocks of the bad component date coded for that period, plus *any* future failures they felt were chargeable to this earlier trouble. All expenses for this were our problem, not the customer's. Although this went a couple of miles beyond our regular warranty, it was our idea of what should be done.

Well, so much for the Troubles We've Seen. The moral is—a guarantee is a lot *more* than words printed on a piece of paper. How would you feel about that guaranteed product shown above—if you couldn't depend on the leash?

The Fisher-Pierce Co., 82 Pearl St., So. Braintree 85, Mass.

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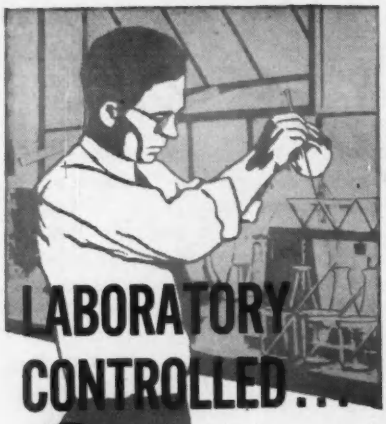

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Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

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Books

Heat Transfer Fundamentals

Introduction to Heat Transfer, Third Edition. By A. I. Brown and S. M. Marco. Published by McGraw-Hill Book Co, 330 West 42nd St, New York 36, N. Y. 316 pages, illustrated. Price $6.75.

Intending to write a college text on fundamentals, the authors have done an excellent job. The student is led mathematically from the modes of heat transfer to the complexities of boiling and condensation.

New material added to this third edition includes a chapter on fluid flow in the convection process, more material on graphical and numerical methods for heat conduction problems, and a section on design of electrical transformers.

Maxwells Equations for Beginners

Engineering Electromagnetics. By W. H. Hayt, Jr. Published by McGraw-Hill Book Co, 330 West 42nd St, New York 36, N. Y. 315 pages, illustrated. Price $8.50.

The author's primary objective is the development and understanding of Maxwell's equations. It is intended as a text for electrical engineering students. The author has performed an unusually good job in clearly presenting a subject which of necessity is steeped in complex mathematics. He is very thorough in including all the steps of his mathematical developments.

Flowers by Night

Garden Lighting. By F. B. Nightingale. Published by Knight Publishing Co, 3800 Canon Blvd, Altadena, California. 224 pages, illustrated. Price $3.50, for six or more $2.50.

Lights in forms natural to garden surroundings are the subject of this text. Written by a lighting engineer with over 25 years experience in this specialized field, it should prove helpful to utility lighting engineers.

Books Recently Received

Engineering Economy, Third Edition. By C. E. Bullinger. Published by McGraw-Hill Book Co, 330 West 42nd St, New York 36, N. Y. 366 pages, illustrated. Price $7.00.

Induction Motors, Single-Phase and Polyphase. By C. S. Siskind. Published by McGraw-Hill Book Co, Inc, 330 West 42nd St, New York 36, N. Y. 385 pages, illustrated. Price $7.50.

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Fast growing Manufacturer of Power and Light distribution transformers requires man capable of assuming full responsibility for production, production control and personnel supervision. Knowledge of all phases of transformer production necessary. This position can ultimately result in the position of V.P. in charge of manufacturing with stock option.

P-8486, Electrical World
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250	G.E.	440	250
250	WEST	2300/4000	250
200	G.E.	2300	250/275
200	RDGWY	2300	250
150	AL-CH	2300	250/275
150	G.E.	440	250/275
150	WEST	2300/440	250/125
125	G.E.	1000	250
125	WEST	2300	250
125	CR-WH	4160	125
100	G.E.	2300	250
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The "Weasel" played an outstanding role in the snow blizzard of 1958, working 24 hours around the clock.

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For Sale at bargain prices:

3	150 HP Motors with starters (1 new)
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LARGE POWER EQUIPMENT
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RENUBILT MOTORS - GENERATORS
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Send for new list to
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When Answering BOX NUMBERS . . .

to expedite the handling of your correspondence and avoid confusion, please do not address a single reply to more than one individual box number. Be sure to address separate replies for each advertisement.

Readers Forum

0.7 Mills—Not 70%

To the Editor:

Probably you have been deluged with "Letters to the Editor" regarding Mr. A. B. Coyle's article in Electrical World of April 21 (p. 68) on transformer losses. I am afraid Mr. Coyle is badly confused as to how to calculate transformer losses when he comes up with an annual saving of 70% of the cost of a new transformer.

L. C. Peterman
Consulting Electrical Engineer
Ford, Bacon & Davis
39 Broadway
New York 6, New York

Mr. Coyle says it had been his intention to use 0.7 mills per kvar hr to reflect variations in costs of turbines with different power factors, as well as other variables. Savings from scrapping the 50-kva transformer cited in the article should have been $79.50 annually, plus the intangible benefits of having a new transformer.

More on "Aluminum Complex . . ."

To the Editor:

I have read with interest the article entitled "New Ohio Valley Aluminum Complex Puts ½ million KVA on Aluminum Buses" by Lawrence Pavane.

The article does not however mention that the major portion of the system described, including the outdoor substation, the 13.8-kv distribution system, the rectifier installation, and the pot lines, were engineered and designed by Singmaster & Breyer, New York, for F. H. McGraw & Co.

I served as Chief Electrical Engineer for Singmaster and Breyer on this project, and the engineering work described in the article was carried out under my direction.

D. J. Vaccaro, P.E.
Singmaster & Breyer
Metallurgical & Chemical Process Engineers

Thanks for Perforations

To the Editor:

Each sping for the past five years, as a part of my preparation for my work at the Public Utilities Executives course at the University of Idaho, I have scanned the prior 12 months accumulation of the Electrical World. My usual procedure is to work backwards. So, a few days ago, I began with your May 12, 1958, issue.

I quickly discovered the new wrinkle of perforated pages, and that I like. I am removing pertinent items. At the moment, I am looking at page 5 of the February 3, 1958, issue where you comment on the pros and cons of the perforated page. So, I am moved to add my belated comments. They are: I like the use of perforated pages!

C. Woody Thompson
State University of Iowa
Iowa City

Ferroresonance

To the Editor:

The following is an answer to Mr. Crann's letter (EW July 14, p 126) concerning the article, "Operating Undergrounded Wye-Delta Banks":

The condition of a single-phase load on a 3-phase, wye-delta bank, all 3-phase load removed, is not a case of ferroresonance. The disconnected single-phase transformer is subjected to practically full line-to-line voltage. The neutral of the bank shifts while the neutral of the supply system remains at ground potential. The vector sum of these two voltages results in above normal line-to-ground voltage on the disconnected transformer, resulting in high voltage well above the spark-over voltage of the arrester.

This condition was checked a number of times using 120-v, single-phase transformers. When all load was removed, the above condition disappeared.

Jerry A. Selvaggi
Distirbution Engineer
Pennsylvania Electric Co

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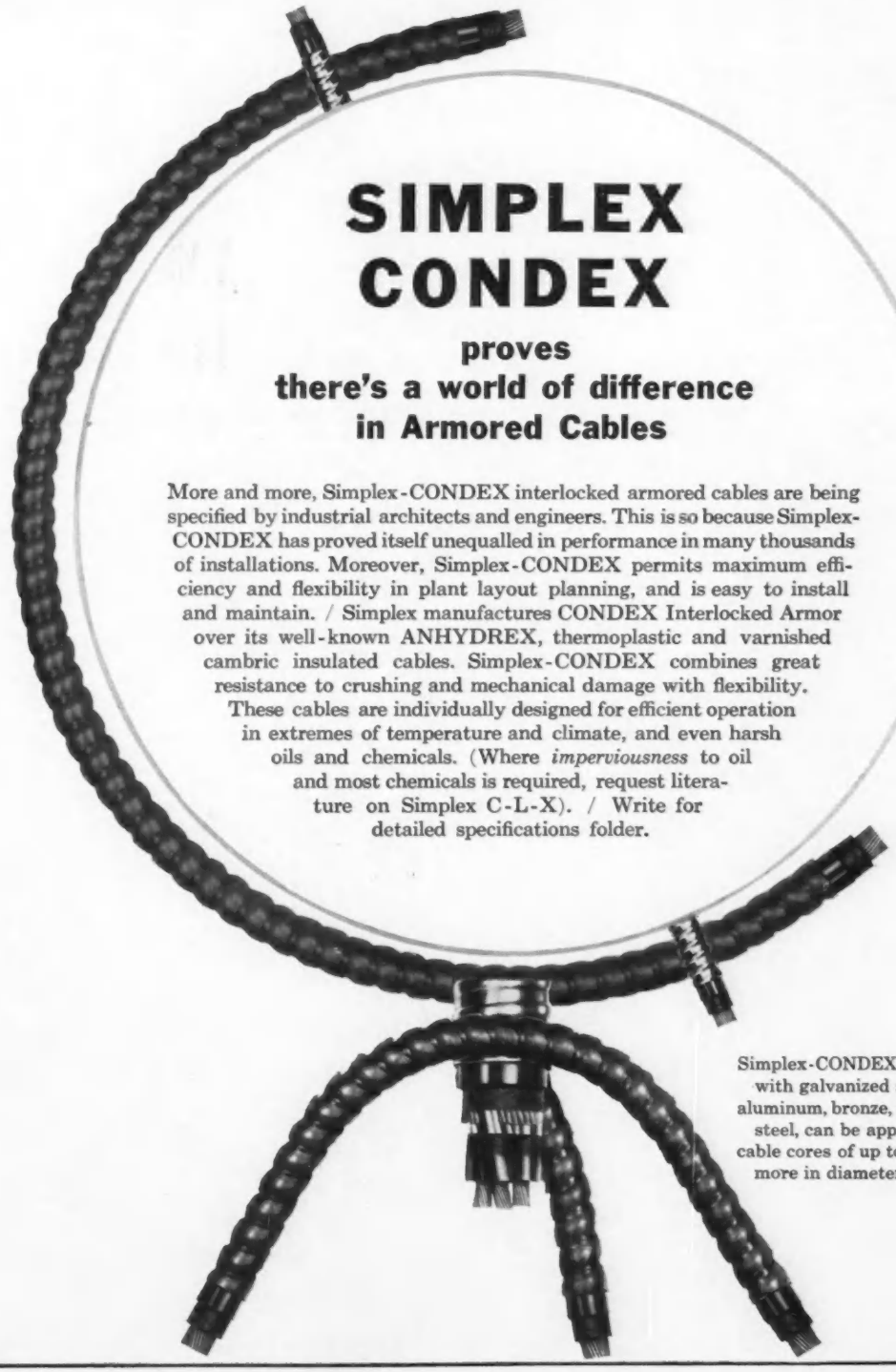

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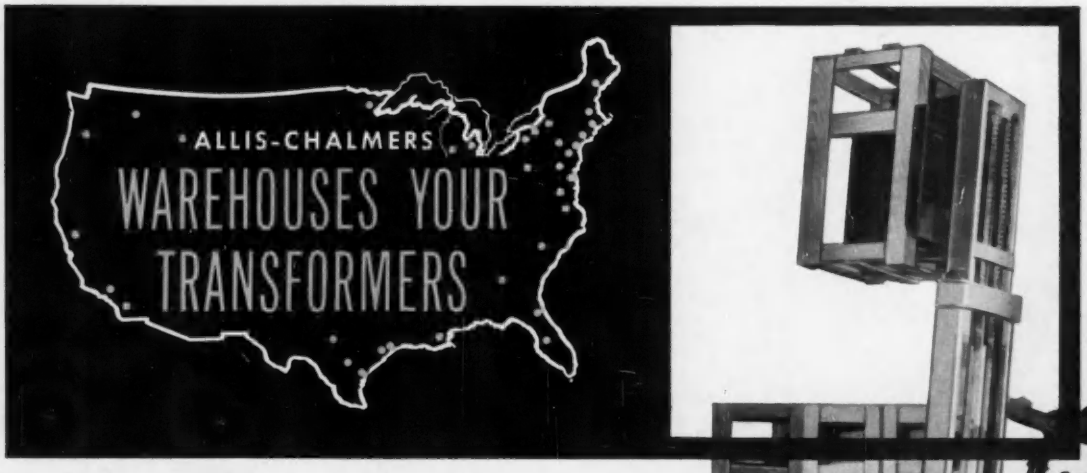
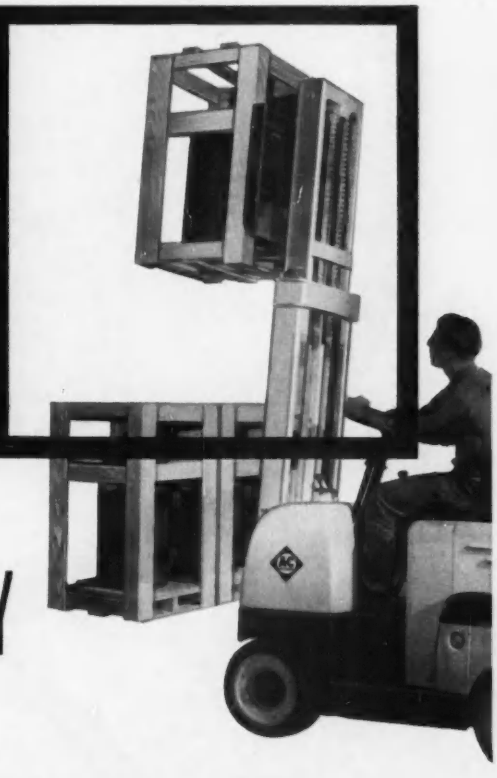
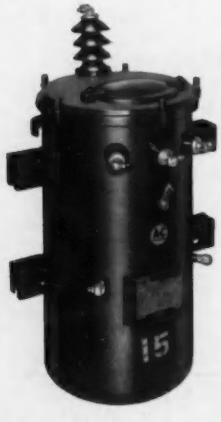




FAST DELIVERY

reduces your inventory



You don't need warehouses bulging with transformers to satisfy your day-to-day operating requirements. You can get fast delivery of one or a hundred transformers with a phone call to the nearest Allis-Chalmers district office. Local Allis-Chalmers stocks include conventional as well as self-protected and overload-indicating transformers in the ratings you most likely need. A representative range of instrument transformers is also available locally. Industry's most careful crating assures you the transformers will arrive in "factory condition," ready for years of dependable service on your poles.

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A-5717